



FRIDAY, NOVEMBER 11.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

Meetings Next Week.—East Tennessee, Virginia & Georgia.

Elections.—Duluth & Iron Range, H. R. Bishop, President.—Housatonic, W. H. Starbuck, President.—Indianapolis, Decatur & Springfield, L. A. Boyd, General Superintendent.—Milwaukee & Northern, C. F. Dutton, General Manager.—Montana Central, E. H. Beckler, Chief Engineer.—New York State Engineer, John Bogart.—Pittsburgh, Marion & Chicago, U. F. Wood, General Manager.—Prescott & Arizona Central, T. S. Bullock, President.—Topeka, Silver Lake & Rossville, J. C. Watt, President.

New Companies Organized.—Burlington, Stillwater and Duluth is incorporated in Minnesota. Fox River Valley Construction Co. is organized in Wisconsin. Long Beach is incorporated in California. Savannah & Fort Valley is incorporated in Georgia. Topeka, Silver Lake & Rossville is organized in Kansas.

Changes and Extensions.—Dakota: Chicago & Northwestern's Dakota Central line is opened from Verdon to Croton. Minneapolis & Pacific is extended to Monango.—Georgia: Knoxville Southern begins work. Macon & Alabama begins survey.—Illinois: Indiana & Illinois Southern is changed to standard gauge.—Kansas: Missouri Pacific completes extension to Arkansas City.—Massachusetts: Central Massachusetts is finished to Northampton.—Minnesota: St. Paul, Minneapolis & Manitoba is surveying from Hinckley to West Superior.—Michigan: Ontonagon & Brule River will be extended southward.—Ontario: Lake Erie, Essex & Detroit River is surveying from Walkerville to Leamington.—Texas: Gulf, Colorado & Santa Fe is completed from Cleburne to Weatherford.

Traffic.—Anthracite coal shipments for the week ending Nov. 5 show a decrease of .8 per cent., as compared with the same period last year; bituminous shipments show an increase of 10.4 per cent. Cotton receipts, interior markets, for the week ending Nov. 4 show an increase of 2.5 per cent., as compared with the corresponding week last year; shipments show an increase of 14.7 per cent.; seaport receipts show an increase of 6.4 per cent.; exports an increase of 15.1 per cent.; cotton in sight is greater than at the same date last year by 3.7 per cent.

Earnings.—For the month of October 45 roads have reported approximate gross earnings. As compared with last year they show a net increase of \$2,488,023, or 14.7 per cent. For the ten months ending Oct. 31 there are reports from 42 roads. All but one road report an increase over the earnings for the corresponding period of last year, the net increase is \$14,197,310, or 14.2 per cent.; 5 roads report their September gross and net earnings; 4 report an increase in gross earnings and 3 an increase in net.

Miscellaneous.—Texas & Pacific is sold.

Contributions.

Post's Steel Cross Ties.

UTRECHT, Oct. 21, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I saw in your issue of Sept. 9, 1887, that you noticed our metal tie and fastenings, but I find in your description some mistakes, correction of which might be useful to your readers.

1. We use no iron (fibrous) for these ties; our trials (dating since 1865) and other European experience have shown that this material is very bad for ties, as it gets longitudinal cracks. The material we use is soft (mild) steel Thomas, Bessemer or Martin-Siemens.

2. The ends are bent down by the press, but it is the essential feature of our tie that the part *DD*, *AA*, *BB*, *DD* [See illustrations in the *Gazette* of Sept. 9] is left intact after rolling; the variation of section (cant, etc.) is obtained at the same time as the thickening directly by rolling, and not by the press. Thus any danger of damaging the sleeper about the railseats (the vulnerable spot where greatest strength is wanted) is avoided.

3. I do not recommend the annealing of the rail seats unless it can be obtained at a very slight expense; if harder steel is used (which I hardly think desirable in the qualities now used) annealing is of more necessity.

4. My company (company operating the Netherlands State Railroads) has now more than 100,000 of our steel cross-ties with variable section, cant and thickening directly by rolling in the road; other companies have some 300,000 in use (Belgium, Germany, France and Holland). Some 150,000 are being manufactured (Sumatra, etc.). Not one has ever been found cracked in the road.

5. We have tried clamp-plate with teeth on the surface; the nuts also have teeth. This roughening still better prevents slipping of the nuts.

6. Our (Netherlands state) normal road, which I designed for our ordinary traffic, has steel ties with variable section, weighing with fittings 117 lbs. each (corresponding to 134 lbs. in constant section); the rails are 29½ ft. long, and weigh 68 lbs. per yard. The whole road weighs 266 lbs. per yard.

Our model road, which I designed for our heavy traffic has steel ties with variable section, weighing, with fittings, 143 lbs. each (corresponding to 162 lbs. in constant section).

I beg to send you hereto annexed a copy of my article in the *Swiss Polytechnic Revue*, in which you will find more information concerning our trials of metal roads, my latest improvements in shape, manufacture, etc.; statistics of cost of maintenance, etc., etc.

J. W. POST,
Permanent Way Engineer, Netherland State Railroad Co.
[The toothed nuts and clamp plates were shown, to small scale, in our issue of Sept. 9.—EDITOR.]

Car Lighting in France.—The Pintsch System.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There may be said to be three systems of car lighting in use upon the French railroads: the primitive candle, the more modern oil lamp, and gas. Of the first, it can only be said to render the darkness visible; but the candle seldom finds its way into the compartments of the first or second-class cars. The oil lamp, too, is not what we are accustomed to. The pétroleuses of the French Commune so frightened the succeeding government that their pétrole (our kerosene) has high duties imposed upon its importation, and to those which admit it to the country are added others when it is carried into Paris; hence as an illuminating oil it is very little known. Under these circumstances it is not to be expected that a railroad company with its exclusive territorial monopoly will pay for a high-priced oil when a cheaper one is in the market. Therefore it is not a kerosene but a vegetable or animal oil that is used for car lighting purposes.

The lamps are removable, and are made to a standard size. There is an opening in the roof to receive them, and before a train starts on its trip a man will be seen walking along the roofs, taking out the lamps, passing them down to a man on the platform, and replacing them by others that are filled. They are also lighted and manipulated from the roof, and though they may leak or smoke the passengers can do nothing with them. It therefore frequently happens that a lamp will leak until the glass beneath the burner is covered with oil, and the flame will be smoking until the light of the car becomes so dim that the passengers can scarcely distinguish each other. In marked contrast with this is the Pintsch compressed gas system that is now in use upon many of the French cars, and which is quite well known in America; and while the companies are so careful of their gas that they only put one small burner in each compartment, the traveler will always be sure of a given amount of light during his whole journey. There is no variation in the flame, no smoking, no leaking. It only remains for the traveler to choose his place, for in a first-class compartment the gas will be turned on enough for reading, in the second-class it is perceptibly lower, and in the third it is decidedly dim. But "you pays your money and takes your choice."

Inquiring into the relative expense of the two latter systems, it was surprising to learn that the gas was decidedly the cheaper. The advantage of the system is that the gas can be made from almost any kind of oil, crude petroleum, shale oil, rape-seed, tallow, grease, fat, vegetable oils, in fact anything. Therefore the company will use those oils which are the cheapest, when everything is taken into consideration, in the immediate neighborhood of its gas works. The Western of France, from whom the greater part of our data was obtained, uses either the oil de colza, which is a rape-seed oil, Scotch oil, which is a shale oil, or sometimes a bituminous oil from Autun. As the Scotch oil gives the most economical results it is the brand usually employed. This costs 14 cents per gallon. A single furnace is allotted 83 gallons of oil for a run of 24 hours and from this the attendants are expected to make 5400 cubic ft. of gas, under 1½ in. water pressure. To do this will require 1,400 lbs. of coal, costing \$2.45. The force about the gas works consists of one chief, two assistants, and two firemen, who are paid \$425, \$400, and \$350 per year respectively. Allowing for 300 working days in the year, the daily cost of labor will be \$6.42. There must be added to this the cost of the retorts, purifiers, steam for gas compressors, and incidentals, which the company averages at about \$1.75 per day per furnace. When running three furnaces or retorts, and producing 16,200 cubic ft. per day, the total cost of production will be \$44.13, or a trifle less than 27½ cents per thousand feet. Therefore it costs for material less than one-tenth of a cent per hour to light a first-class passenger compartment in France, which is less than an inferior oil lamp will cost. The economy, however, does not end here. The by-products are also valuable. The tar sells for \$8.40 per ton, and the more volatile benzenes resulting from condensation at \$2 per 100 lbs. Of the latter, there will be about 2 lbs. per 1,000 cubic feet compressed. The tar is worth about \$1.50 per day.

We have thus far been speaking of the actual allotment of oil and fuel for a given production of gas. This is done in order to introduce the premium system and give the men a chance to increase their wages. Therefore, 200 kilograms of oil and 450 kilograms of coal are allowed per 100 cubic meters of gas produced. On this the following premiums are given:

1st. Nine francs per 100 kilograms of oil saved from the allotment.

2d. Nine and one-half francs per ton of fuel saved.

3d. Twenty-five francs per month for every increase of one-quarter candle-power in the average illuminating quality of the gas, based upon a photometric standard of six candles per one-quarter cubic metre consumption per hour.

In order to prevent the men from crowding in a high gas production and of a poor quality there is a rebate imposed should the illuminating power fall below the standard by one-

half a candle on any one day of the month. The premiums paid to the whole force amount to about \$220 per year, and as they are only paid one-half of the value of the material saved there is a corresponding saving to the company, which is about one per cent. on the cost of the plant, and the sale of by-products will pay over 2 per cent. more.

Most American readers are familiar with the system and know that, after the production of the gas, it is compressed in strong wrought-iron tanks and then led off to convenient points, where it is run into tanks attached to the cars to be lighted. It is meeting with an almost universal adoption in Europe, because of its cheapness, its brilliancy, its freedom from smoking and because it requires no attention save the filling of the car reservoirs and the lighting of the burners.

GEORGE L. FOWLER.

Claim Agents and Their Doings.

NEW YORK, Nov. 5, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have just finished reading your article in to-day's paper on the Freight Claim Department, and am roused to some comments. I have been wondering why something of the kind was not written long ago, and on behalf of the shipping public desire to thank you for taking the initiative. The position you take is fair enough as far as it goes, but scarcely goes far enough. Such a cancer on the railroad body politic, as the management of claims has often proved itself to be, requires a knife, not an application of liniment, however good that liniment may be. I know a case wherein a railroad line receipted for a certain number of packages and failed to deliver two of them. After the usual haggling (I use the word usual advisedly), which lasted about a year, the road on which the shortage occurred declined payment—on what ground do you think? Because the printed part of the bill of lading read "contents unknown!" No, sir; we need heroic treatment. The common law liability of common carriers has been perverted into the bill-of-lading liability of shippers and we need the passage of express statutes, reaffirming the carrier's responsibility in terms so clear that the claim agent cannot possibly misunderstand them, and helping such understanding by providing penalties for violations. The states of Texas and Arkansas deserve credit for passing such laws as you mention compelling carriers to accept the bill of lading rate, and the courts should have praise too for not letting a tricky railroad crawl from under the law by any false weights. Let us have more of such legislation in other states, together with laws which will forbid railroads to limit their common law liability by any so-called "contracts" with shippers wherein the railroads do all the contracting. Then let us have another law which will compel railways to pay for all losses unless they can show that such losses were caused by the act of God or the king's enemies. You see, Mr. Editor, I believe that the matter has got beyond railroad cure and I believe this in spite of the fact that there are some good and honest claim agents—exceptions enough to prove there is a rule the other way. It's another case of Sodom, and the number of righteous men necessary to save it.

Then that suggestion of yours that the trouble might be remedied by annual conventions of claim agents. This might work just the other way. Suppose such a meeting should resolve to draw the lines tighter than ever. Do you believe that they would not dare do it? Then you do not know them. As a class they are capable of doing that very thing, and the curious fact about the matter is that in voting such a resolution they are also capable of thinking that their action would settle the question. It would be a good thing if somebody would send such men a history of the French Revolution and the causes which led to it. Some analogies might be drawn.

Of course I know just what you will say, that the merchants are just as bad in their way. But is this so? A trader will get the lowest possible rate of freight, and get it sometimes if he can by lying to one line about the rates quoted him by a competitor. The same trader will, as a general thing, be honest in his demand for overcharges and damages where hard cash is concerned. It's the same curious standard of honesty which we find in men who would scorn to touch a penny of money but who will grab an apple while going by a store. At any rate this is beside the issue. I am not discussing the refusal of a railroad to pay any unjust claim, but their refusal to pay a just one. Herein the mercantile public have a real grievance. Will the claim agents adjust it? If not, then let the railroads take the consequences: "Though the mills of God grind slowly, yet they grind exceeding small."

SUFFERER.

Willard's Automatic Track Gauge.

The track gauge shown in the accompanying engraving has been lately invented by Mr. D. Willard, and is in use on the Minneapolis, Sault Ste. Marie & Atlantic with, we understand, very satisfactory results.

It consists generally of two shoes pressed outward against the inner side of each rail head and any means of communication with a suitable indicator.

It is to be attached to any car, but preferably to a hand car, and when in use enables the track foreman to tell the exact gauge of his track as he passes over his section.

The action of the gauge is as follows: The gauge is fastened under car at a proper distance above the rails so that the shoes *C* press against the inner sides of each rail head, being pressed out at all times by the springs *a* and *b*.

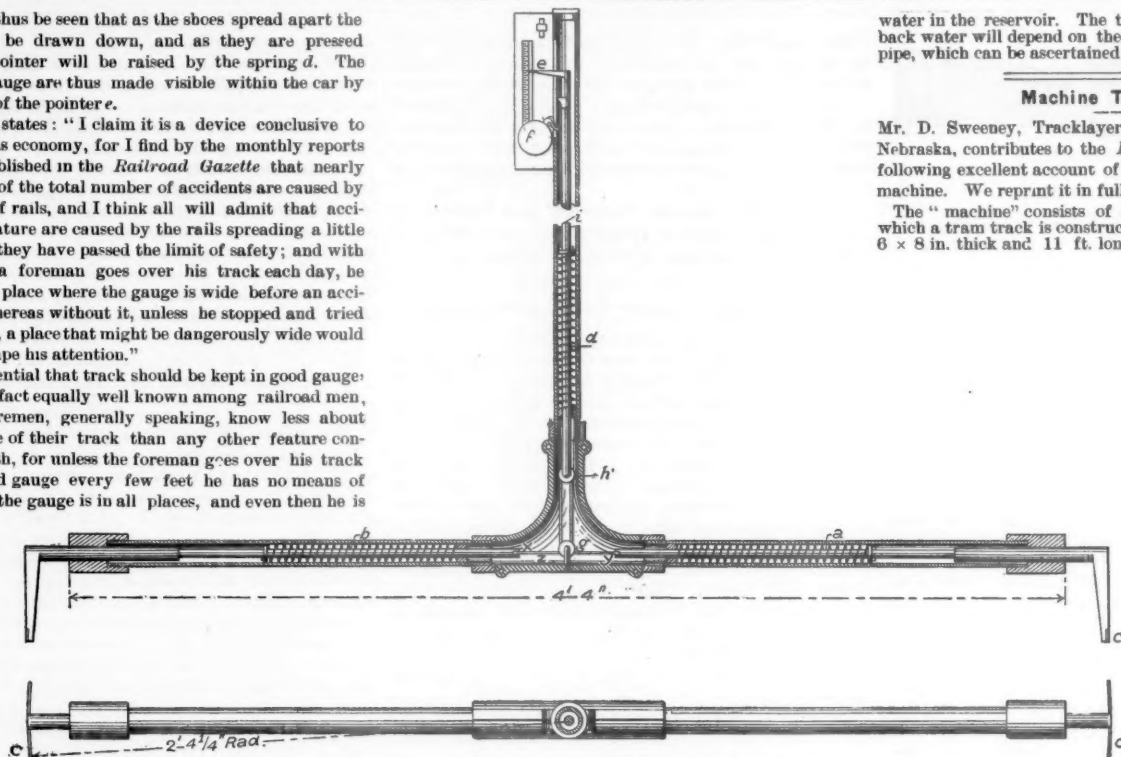
The pointer *E* is held up by the spring *d* around the rod *i*, which may be of any suitable length.

The rods *y* and *x*, which connect with the shoes *C*, are connected with the rod *i* by means of a small steel chain or cord passing through the double pulley *g* and the single pul-

ey h. It will thus be seen that as the shoes spread apart the pointer e will be drawn down, and as they are pressed together the pointer will be raised by the spring d. The variations in gauge are thus made visible within the car by the movement of the pointer e.

The inventor states: "I claim it is a device conclusive to safety as well as economy, for I find by the monthly reports of accidents published in the *Railroad Gazette* that nearly eight per cent. of the total number of accidents are caused by the spreading of rails, and I think all will admit that accidents of that nature are caused by the rails spreading a little at a time until they have passed the limit of safety; and with my device, if a foreman goes over his track each day, he will detect any place where the gauge is wide before an accident occurs, whereas without it, unless he stopped and tried his hand gauge, a place that might be dangerously wide would very likely escape his attention."

It is very essential that track should be kept in good gauge; but it is also a fact equally well known among railroad men, that section foremen, generally speaking, know less about the exact gauge of their track than any other feature connected therewith, for unless the foreman goes over his track and tries a hand gauge every few feet he has no means of knowing what the gauge is in all places, and even then he is



WILLARD'S AUTOMATIC TRACK GAUGE.

liable to miss some, and even if that way is reliable, he should walk over his track and gauge it at least once each week (and much oftener on some roads where soft ties are used and the road-bed is not solid) and that would be a matter of some considerable expense in the course of a year and would not be perfectly reliable.

The device under notice can be attached to the car in such a manner that it can be raised up against the car bottom when not in use, and it will then be entirely out of the way; the indicator would naturally be placed near the middle of the car where lever handles work, and it would also be out of all way.

There is a bell attachment connected with it, which can be arranged to give alarm if the gauge in any place is dangerously wide. A paper register can also be attached, which will mark the variations in gauge as the car passes along.

This track gauge can be made of gas pipe and suitable castings, etc., at a cost (stated by the inventor) not to exceed \$2.50.

Any further information as to the gauge can be obtained of the inventor, Mr. D. Willard, Turtle Lake, Wis.

Reservoirs for Railroads, Mills, Farm Use, etc.*

In the case of railroads where reservoirs are most in use, the wells which are usually the first source of water supply soon become inadequate, and their use is a source of heavy expense. Well water is also objectionable on account of the lime it contains. The quality of the water has a great deal to do with the cost of maintenance of boilers, as will appear from the fact that the alkali in the water of some Western states will render the flues unfit for use in the short space of six months, while on the other hand, sets of flues on the Southern Division of the Illinois Central Railroad, where surface water is used, have been known to last fifteen years without repairs. But the main cause of the introduction of reservoirs was the inability of wells to furnish the required amount of water at all times and seasons. The amount required has also steadily increased; for while a locomotive some years ago consumed from 1,200 to 1,500 gallons of water in running 25 miles, they now use from 1,500 to 3,000 gallons in going the same distance. The extra amount is made necessary by the increased number of loads that are now hauled in a train, and the increased weight of the loads from 10 tons to 15 and 20 tons per car.

One of the first reservoirs built on the line of the Illinois Central Railroad was at South Neoga Tank. It had a capacity when built of about four million gallons. Reservoirs have also been excavated at Kinmundy, and at the first station north of Mattoon. These, with water from Crooked Creek and Little Wabash River, give surface water for passenger engines between Centralia and Champaign, except at Champaign, where only a partial supply of surface water is had.

Twenty years ago there were sixteen water stations between Champaign and Centralia, a tank for every eight miles. At nine points the water was pumped by windmills or by hand, at three places by horse-power, and at four stations by steam. These sixteen water stations have now been reduced to six, and the pumping is done by steam. They are now an average distance of 20 miles apart, instead of 8 miles as formerly. The standard tender on the Illinois Central Railroad now has a capacity of 3,000 gallons, and as soon as all locomotives are supplied with tenders of this capacity the average distance can be made still greater; although the rate of consumption will probably continue to increase.

During the severe drouth of last season the reservoirs on the section of road just named partially failed; but by taking water at Mattoon, furnished by the City Water Company, and in some cases using double tenders, the road was able to handle its business.

In the construction of reservoirs the location desired is one that has a sufficient water-shed to furnish the required amount of water; also one that has a natural basin, in order that when the water is confined it shall not back up on or overflow adjoining land. It should, of course, be as near as practicable to the supply tank, so that the cost of pipes for conveying the water from

the pump would not be too great. The Illinois Central Co., however, conveys water in this way at Little Wabash River, nearly one and a half miles, and at Crooked Creek about two and a quarter miles, and at Anna, in Union County, the water is pumped from a spring and forced about one-half mile to a tank on the top of a hill, from whence it gravitates through pipes to the supply tank at Anna station, a distance of about one mile.

The cost of excavation will depend on the nature of the earth at the point where the reservoir is located. Examination should be made if stone or beds of gravel are liable to be encountered. The cost of excavation at South Neoga in 1869 was about 22c. per cubic yard; and at Kinmundy in 1885 the cost was 19½c. per cubic yard. The reservoir last mentioned was formerly a second or third class way station, the supply being furnished by a well and the pumping done by windmill and by hand. It has within the last two years been made a first class water station, a reservoir of nearly two million gallons capacity having been excavated, a brick engine house built, and a new tank or tub erected. In constructing the latter, which is some 700 ft. from the pump house, a new plan was adopted, that of setting the tank, which is placed on open framework, back some 50 feet from the track, and of supplying the locomotive tenders by means of pipes and a penstock. Taking the expense of constructing this water station as a basis, a fair cost of water supply can be arrived at. The cost of the reservoir at Kinmundy, however, was only one-half the following estimated amount, as it contains but two million gallons, while a standard reservoir should contain at least four million gallons.

Cost of a First-class Water Station.

Reservoir	.....	\$3,000
Plant	.....
Engine-house, tank and penstock	.....	\$1,950
Machinery and pipes	.....	750
		2,700
Total amount invested	.....	5,700
Interest on investment at 6 per cent	.....	342
Depreciation and expense of plant at 5 per cent.	.....	135
Wages of pumpmen	.....	420
		897

Estimated Amount of Water Used.

Three passenger engines and 7 freight engines each way daily, equivalent to 20 tenders of 2,000 gallons = 40,000 gallons daily = 13,600,000 gallons per year.

The expense at that rate is about 6½c. per thousand gallons. The rate paid at Mattoon as mentioned was 17c. per thousand gallons. It was a temporary supply, however.

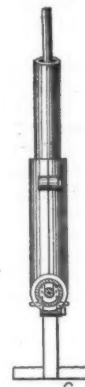
In order to make use of the banks formed around reservoirs by wasting the earth excavated, the dam at outlet in some cases has been kept high. This backs the water up in rear of reservoir, and unless there are banks each side of the inlet the water floods adjoining lands. If the reservoir is located in low, swampy or flat grounds, the water could not well be confined between banks in this way, and the consequent overflow would be liable to cause trouble. In such cases the following plan is suggested: Build a dam, designated for convenience a "retaining wall," at the inlet or point where the water enters the reservoir. This should be of the same height as the dam at the outlet where the overflow water is discharged. In this retaining wall build inlet boxes or pipes having slide gates or valves. If boxes are used, they should be placed one above the other, securely framed together and made water-tight. Wings should be extended into the retaining wall on each side, so that there will be any possibility of the water forming a break in the dam at the sides of the inlet boxes. This furnishes an inlet for the water at various heights from the bottom of the inlet to the top of the retaining wall. The valves should be placed on the inside of the inlet next to the reservoir, and hinged on the top, so that they will swing in towards the reservoir. This will allow a free inlet for water coming to the reservoir. The valves should also be so arranged that when the backwater at the inlet is drawn off, the weight or force of the water in the reservoir will force them down or back into place and prevent the escape of the water in the reservoir. If pipes are preferred to boxes, they can be arranged in same way, being laid in mason work. In order to carry off the backwater at the inlet that causes trouble by overflowing adjoining land, lay an ordinary tile drain of the required capacity, beginning at the bottom of inlet and outside of retaining wall, then passing around and outside of reservoir, and ending at outlet and outside of the overflow dam. The object of this drain as stated is to carry off the backwater. As soon as the rush of water subsides, the drain will begin to lower the water in question, which will cause the water in reservoir to close the valves in the inlet boxes and retain a full supply of

water in the reservoir. The time required to carry off the back water will depend on the amount of water and size of pipe, which can be ascertained and provided for.

Machine Tracklaying.

Mr. D. Sweeney, Tracklayer on the Chicago, Kansas & Nebraska, contributes to the *Railway Service Gazette* the following excellent account of tracklaying with the Harris machine. We reprint it in full.

The "machine" consists of a train of 34-ft. flat cars on which a tram track is constructed by laying five oak timbers, 6 x 8 in. thick and 11 ft. long, at regular intervals across



the deck of each car, and spiking 30-ft. rails on the ends of these at 8½ ft. gauge. The gap between cars is filled by pieces of rail about 6 ft. long, or short enough to allow for play in draw gearing. They are retained in position by fish plates or angle bars attached to main rails, by single bolt in end holes of plate and rails so that plates may extend as far as possible toward the gap between cars. The base of the short rails is trimmed off about 18 in. back from each end, leaving the neck or stem in shape to drop into the groove formed by the projecting ends of fish plates and thus affording a ready means for connecting or disconnecting tram track without undoing joint fastenings. The inventor has a different and very defective arrangement for connecting the short rails. The one described was applied by the writer and has saved us much time and annoyance. Each iron car is fitted with five 5 x 14 cast iron rollers, bung in small blocks and attached to cross ties and car deck along the centre line. The rails are loaded in two compact piles on either side between rollers and tram rail, leaving a two foot runway in middle of cars, through which the rails are pulled on rollers to front end of train.

Rails are piled with running side in, and each load is trimmed with full supply of bolts, spikes and fish plates. Kegs are stored on vacant space at ends of car, and plates arranged on car deck between the tram ties.

The flats have tram track but no rollers. The front car is called the Pioneer, and has in addition to tram track and rollers, two heavy beams attached which extend 20 ft. ahead and are framed together by a cross timber in front, which acts as a dump block for the tram, and also supports a double ended roller 2 ft. below, over which the rails pass to a portable dolly placed 25 ft. ahead on the ties. The Pioneer also carries an assortment of short rails for use on curves and bridge approaches.

The "Dolly" is a light tower built frame, 3 ft. high, with a 4 x 18 in. roller on top.

The little tram car that conveys ties forward over the train is about the only thing in the outfit that entitles the inventor to much credit for ingenuity. This has wheels and axles and a skeleton body something like, but much lighter, than a common iron car; the wheels are adjusted for 8½ foot gauge. It has a flat frame 9 ft. long and 5 ft. wide, placed on rollers on top of main body between guides and loose clamps that permit it to slide forward 3 ft. when dumping load.

MODE OF OPERATION.

Material for a mile of track is loaded on 15 cars in the following order: Five tram flats, 74 rails per car; 5 tram flats, 340 ties (crosswise) per car; 5 box cars, averaging 260 ties per car, and train made up in the order named, with rail cars in front next to Pioneer. A man with fork turns two rails on first and two on second car, onto rollers. Four men with hooks pull them to the Pioneer, leaving them with ends matched convenient for splicing. Two expert bolters on back end of Pioneer fasten them together in two rail sections with fish plates and two track bolts, and also arrange expansion room and put in wooden shims; meantime four men pile 18 ties on the little tram car from nearest tie flat and run it forward, compelling bolters and iron pullers to take refuge on some planks placed on ends of ties outside of tram rails. When the car reaches the extension beams on Pioneer, a latch is sprung, the front wheels strike the dumping block, the sliding frame shoots forward with the load, causing the hind wheels to rise up and the car to tilt forward to an angle of 40 degrees, while the ties slide off in a pile on the roadbed, when they are seized upon and quickly distributed over a 60-ft. section by the front men.

After the load is dumped, the tie car tilts back to its ordinary level, the frame is slid in and latched, and car hurried back for the next load. By this time the bolting is done, and the iron pullers start out the two sixty-foot rail sections side by side, the front men guide a section on each side of brace that suspends double ended rollers 20 ft. ahead of car, while another squad guide the front end of rails on the portable dolly still further ahead. When rails run out as far as required, a few men hold the section on gauge side steady, while the balance range themselves along the line side, lift that section from the rollers, drop it on the ties and heel it to place between fish plates loosely attached by one bolt to front end of former "set out," while most of the front men are throwing down and heeling the section on gauge side, 4 men are spiking quarters and centres (3 ties per rail) on line side; 4 more with two gauges follow immediately spiking the same ties on gauge side. While spiking is being done, two men shim and bolt joints just heeled, and two others attach fish plates to front end of new "set out" (or 60 ft. panel of track).

The train is then moved forward 60 ft. and stops when the front trucks of Pioneer are within 8 or 9 ft. of the end of track. The tie car dumps another load as train is stopping,

* By S. F. Balcom. Reprinted from the Proceedings of the Illinois Society of Engineers and Surveyors.

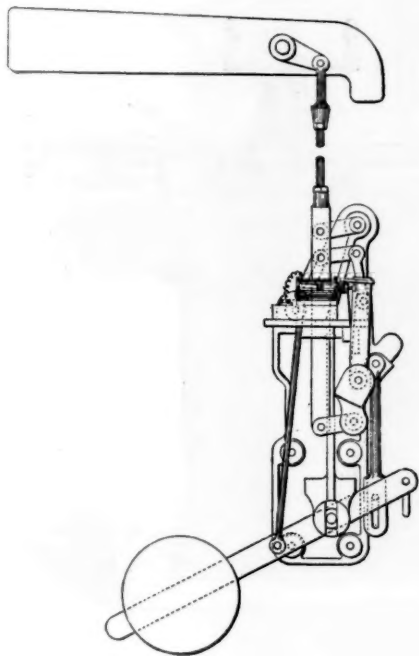


Fig. 1.

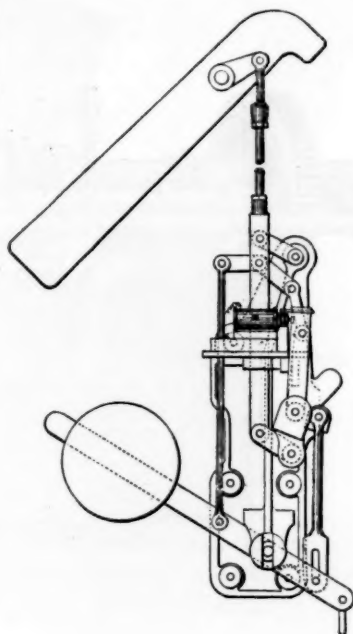


Fig. 2.

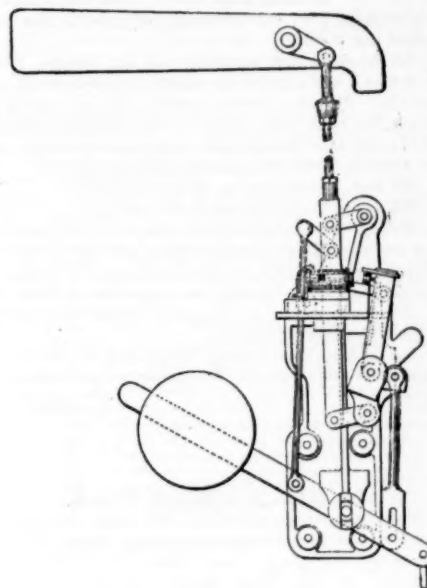


Fig. 3.

ELECTRIC SLOT SEMAPHORE SIGNAL.

and the whole process is repeated as before. As the track is only half tied from tram flats by front men, it devolves on the back men to supply the other half from the box cars in rear. This is done by posting men in the first two cars to throw out ties and a man alongside to note how many are needed in each panel and see that the proper number is thrown out at every stop. It is best to have extra help here to prevent ties from going down embankments when crossing fills. When first cars are unloaded, the men change to the next two and finally finish with the fifth. Four men follow the engine and complete the bolting of track joints, 12 to 14 men with some picks and two track jacks pull in and space the back ties, 16 to 20 spikers, with 8 or 10 nippers, follow with the spiking, while 5 men attend to track lining in the rear. The front gang consists of 8 spikers, 4 nippers, 12 iron men, 2 bolters, 2 men to carry portable dolly, 1 to handle tie line, 1 to peddle spikes, 1 to handle 30-ft. pole and mark ties, 1 to peddle splices and one water boy. The gang on top of trams consists of 2 bolters, 4 to 6 iron pullers, 1 to turn iron on the roller and drop off spikes and bolts at proper intervals, and 6 to handle ties and run tie car. If two tie cars are used it will require 8 men to run them. There is also a water boy; 2 spike peddlers and 1 tie marker in back gang. The markers carry a measuring board, which they place on the line end of every tie and draw a chalk mark across them 16 in. from the end to guide the spikers in keeping ties to line. The work requires 110 to 115 laborers, 1 general foreman, 1 beeler, who acts as foreman of front gang, one foreman in charge of back spikers, one foreman for "tie rustlers," and a subforeman lining track. This completes the organization required to lay two miles a day with the machine. It has been customary to use but one tie car, but we are now using two. A single tie car can keep pace with the rest of the work until the train is half unloaded, after that the run becomes too long and time is lost awaiting ties. We have overcome this hindrance by using a second car in the rear as a relay. Four men load this tie flat and meet the front car near the middle of train when load is quickly transferred to the dump car; while this is going to the front, the relay car picks up another load and meets the front car at the half way point again.

This arrangement saves about two hours per day, and adds over 2,000 ft. of track more than is possible to lay with one tie car on a long train. With four quick bolters in front, easily worked bolts and a well-trained front gang, it is common work to lay off a 60-ft. "set out" in every 2½ minutes for hours at a time, provided there is sufficient steam power behind to move train up as quickly as men can handle the material. We have laid 1,300 ft. in 30 minutes, 5,600 ft. in 4 hours and 5 minutes, 11,100 ft. in 8 hours and 30 minutes, and 11,000 ft. in 8 hours and 55 minutes. We never have the full 10 hours at actual work, owing to delays in switching and in running to and from the work, but we usually lay over two miles every day that we have 9 hours on the works, and I am confident that we can lay upward of 12,000 ft. in 10 hours work, at a cost of \$240 for gang and foreman; add to this the cost of motive power and trainmen and the expense of loading material on tram cars, and I doubt if it will all foot up \$150 per mile for tracklaying. There are no teams used or required, as all material is handed off the train on the spot where required. I know of no handier or cheaper method for tracklaying than this. Some may object on the grounds that ties are not bedded and rails may be surface bent. This is a good theory, well tinged with old fogyism, but considerable practice with a heavy steel rail satisfies me that little or no injury occurs from our failure to bed ties, especial as the track is surfaced nearly as soon as laid. We leave out very thick ties, reserving space for them, and they are put in by the surfacers when track is raised. There is a great deal of labor and money wasted on many roads by needless work on unessential details.

Electric Slot Semaphore Signal.

The accompanying illustrations show an important and recently-introduced improvement in signals, the object of which is to enable a signalman to control the outdoor semaphore signal worked by another signalman at the next cabin in such a manner that it cannot be made to indicate safety without the concurrent action of both signalmen, while either signalman, quite independently of the other, can instantly change the signal from safety to danger, and hold it at danger against

any action on the part of the other signalman. In like manner several signalmen can act on the signal, irrespective of distance.

Electricity has been employed in contrivances for locking signal levers in their normal positions, i. e., holding the signal in the "danger" attitude, but if the lever is already pulled over and the signal placed in the safety attitude those contrivances are powerless to alter it. The electric slot is the only apparatus by which outdoor signals at one station can be instantaneously acted upon and changed from safety to danger, and sustained in the latter position at will from other stations, irrespective of distance.

This power of direct and instantaneous action upon the outdoor signals at a distant station might under certain circumstances of emergency be of supreme importance in preventing accidents or in mitigating their consequences.

The action of the apparatus is as follows: When a current of electricity is sent through the electro-magnet *M*, it keeps the armature which is attached to the vertical lever attracted, and on pulling the wire and raising the weighted lever fixed at the bottom of the post the semaphore arm is lowered; if now the current of electricity ceases to flow the vertical lever falls away from the magnet, and by lowering the centre lever the semaphore arm is raised to "danger." When the weighted lever at the bottom of the post is lowered it again raises the armature lever to the vertical position and into contact with the magnet. If no current is flowing, on raising the weighted lever by pulling the wire the armature lever falls away from the magnet, and no movement of the semaphore arm takes place.

Fig. 1 shows the apparatus in the normal position with the semaphore arm at danger.

Fig. 2 shows the arm lowered and the electric current flowing through the magnet.

Fig. 3 shows the semaphore arm at danger through the cessation of the electric current in spite of the action of the man who works the signals.

Only one movement of the signal lever is required to work the signal.

If required, the passage of a train over the line can, by means of a treadle apparatus, be made to act upon the elec-

tric slot, so as to place the rear signal to danger in case the signalmen omit to do so.

This invention has been introduced by the well-known English firm of signal makers, Messrs. Saxby & Farmer, of London.

We are indebted to the *Railway Engineer* (England) for the above description and accompanying illustration.

The Westinghouse Air Brake Tests.

The Westinghouse series of brake tests was continued in Albany on Wednesday, and the train afterwards ran to Boston, where the trials will be repeated next Monday. During the week further trials will be had near New York.

The run from Albany to Boston must have been instructive, and we hope to give some notes of it later. The mere hauling of the train over the roads at passenger train speed is a notable feat. The following is the programme of tests as heretofore made. They are made with a train of fifty freight cars, each car 38 ft. 4 in. long; capacity, 60,000 lbs.

1st Test. Emergency stop, train running 20 miles an hour.

2d Test. Emergency stop, train running 40 miles an hour.

Visitors are requested to take position near the stopping post to observe the way the train is stopped.

3d Test. Applying brakes while train is standing still, to show quickness of application. The train will be placed so that the 35th car will be at the stopping post, and the operation of the brakes can be observed at this point. When train is in position two blasts of the whistle will give notice to be ready, and one blast a minute later will be given when the brakes are applied.

4th Test. Emergency stop, with passengers aboard, speed 40 miles per hour. Before this test begins visitors are requested to get on the cars to observe, as passengers, the effect of quick stopping. Two cars in the front of the train, two in the middle and two in the rear are provided with seats and steps.

5th Test. Service stop and time of release. Train will be stopped at the stopping post and started again as quickly as brakes can be released. This test shows the kind of stop made when a sudden stop is not necessary, and how promptly the brakes can be released.

TABLE SHOWING RESULTS OBTAINED WITH WESTINGHOUSE EXPERIMENTAL 50-CAR FREIGHT TRAIN, OCTOBER AND NOVEMBER, 1887.

Distance of Stop in Feet, Corrected for Grade and Speed.

No. Test.	KIND OF TEST.	Buffalo.	Chicago.	Cincinnati.	Cleveland.	St. Louis.	St. Paul.	Average.
1....	Emergency stop, 50 empty cars, 20 miles per hour.....	179+	152	161	168	157	177	166
2....	Emergency stop, 50 empty cars, 40 miles per hour.....	633+	569	630	575	511	568	581
4....	Emergency stop, 50 empty cars, 40 miles per hour.....	636	469	599	654	481	636	579
6....	Hand brake stop, 50 empty cars, 20 miles per hour, five brakemen.....	655*	.....	830	890	799	.....	794
7....	Breaking train in two.....	59‡	57‡	22‡	.....	61‡	.....	50
[All above stops made with about 65 lbs. pressure and insufficient leverage to slide wheels.]								
8....	Emergency stop, 20 cars, 20 miles per hour, increased leverage and 80 lbs. pressure, showing shortest possible stop, regardless of sliding wheels, as in passenger service.....	89	120	95	91‡	101	97	99
9....	Ditto, ditto, except speed 40 miles per hour.....	410	399	378	349	389	368	382

*Seven brakemen. †Wet rail. ‡Distance apart of portions of train when stopped.

6th Test. Hand brake stop. This stop will be made at 20 miles an hour with five brakemen at their posts.

7th Test. Breaking train in two. This will be done about the stopping post, and visitors are requested to take position about that point.

All the above stops are made with the braking power so low that it will not slide the wheels of empty cars in regular service. By using greater power, quicker stops could be made, but there would be more or less sliding of wheels, and it is not thought that the advantage gained would be enough to make up for the damage done in freight service.

8th Test. Train running 20 miles an hour.

9th Test. Train running 40 miles an hour.

These stops are made with a train of twenty cars, to represent the ordinary passenger train, and the purpose of the experiments is to show the shortest distance in which a train can be stopped in an emergency, regardless of sliding wheels.

The brake power is increased to equal that usually employed on passenger trains.

The trials at West Albany, Wednesday, the 9th inst., were made on a 35 foot grade. The results were as follows:

Test No.	Speed, miles per hour.	Stops, in feet.
1	20	158
2	30	560
3	37	580
4	19	78
5	40	358

The stop in test No. 8 is the best yet made.

These trials were seen by some 300 people, amongst whom were Messrs. Toucey, Buchanan, Priest, Bissell, Gibson and Orton of the New York Central & Hudson River; Bradley, of the West Shore; W. H. Turner, New York, New Haven & Hartford; Young, Blackall, Marcy, Sprong, Hammond, North and Cory, of the Delaware & Hudson Canal, and representatives of other Eastern roads. There were present also a number of the professors and students from the Rensselaer Polytechnic Institute.

The table herewith shows the results of the trials, including those at Buffalo, but not those at Albany.

Form for Reporting Per Diem Car Service.

The roads which are now settling for car service on the new plan have put in use the form recommended at the last meeting of the Car Accountants' Association. It is simply an improvement on the old form of daily junction report, as shown in the following imaginary specimen, which we take from the *Railway Equipment Guide*:

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

OFFICE OF CAR ACCOUNTANT.

CLEVELAND, O., Oct. 25, 1887.

Report of C. C. & I. cars delivered to connections, with date of receipt and number of days for which the per diem rate will be allowed.

..... Car Accountant.

RECEIVED FROM.		Car number.	DELIVERED TO.		Days.
Road.	Date.		Road.	Date.	
C. C. & I.	10-3	549	C. C. & I.	10-23	20
"	10-4	732	"	10-23	19
"	10-6	143	"	10-23	17
"	10-8	684	N. Y. C. & H. R.	10-23	15
"	9-26	8,644	"	10-23	27
"	9-20	8,763	"	10-23	33
N. Y. C. & H. R.	10-20	2,102	C. C. & I.	10-23	3
"	10-21	4,023	"	10-23	2
"	10-22	6,329	"	10-23	1
"	10-22	6,642	"	10-23	1
"	10-19	5,376	"	10-23	4
F. & P. M.	10-17	8,909	F. & P. M.	10-23	6
C. & N. W.	10-15	8,576	M. C.	10-23	8
T. & O. C.	10-20	4,632	C. H. V. & T.	10-23	3
M. C.	10-21	5,072	C. H. & D.	10-23	3
C. R. I. & P.	10-18	6,480	C. E. & Q.	10-23	3
D. A. V. & P.	10-19	2,298	E. & F.	10-23	4
N. Y. L. E. & W.	10-13	1,219	N. Y. C. & St. L.	10-23	10
D. L. & N.	10-12	1,532	M. C.	10-23	11
W. & L. E.	10-15	8,746	F. A. A. & N. M.	10-23	8
Total					189

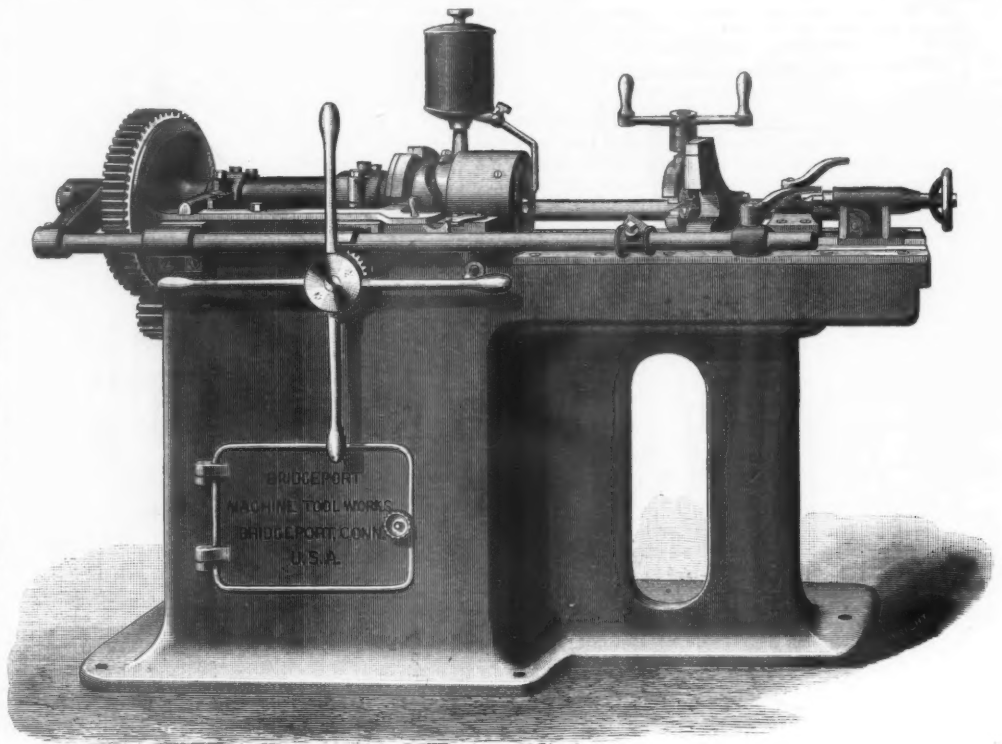
From the daily station interchange reports the cars are first noted that are delivered to connections in columns headed "Car Numbers" and "Delivered to." Thus arranged, they are in the most convenient form for entering upon any form of record, and any errors are at once detected. As each car is entered upon the record, the date and road from which the car is received is placed in column "Received from." The difference between the dates extended in column "Days" represent the time for which per diem will be allowed on each car. The additional work in the car record office for reporting per diem is thus reduced to that of simply giving the roads from and dates on which cars are received in addition to the information now given on the daily junction card. The only other course would be to compute the per diem from the records at the end of the month.

Improved Bolt Cutter.

The machine here illustrated is a new bolt cutter, recently brought out by Messrs. E. P. Bullard, Bridgeport Machine Tool Works, Bridgeport, Conn.

As will be seen by reference to the illustration, the machine has a hollow spindle. At the back end of the head is a yoke, to which are attached two side rods, one on each side. An auxiliary spindle with centre is connected to this yoke, and passes through the main spindle and projects beyond the die head.

The tail block is similar in form to that used on a lathe, and it can be clamped in any desired position upon a carriage which slides to and from the head. This carriage has also mounted upon it the necessary devices for preventing the rotation of the bolt while being acted upon by the dies. The side rods are fastened to the carriage by means of clamps, and they can be adjusted for the length required between centres and when this is done, a rigid rectangular frame is formed. Rack teeth are cut on the under side of the side rods, and thus by means of pinions and pilot wheels this frame with



IMPROVED BOLT CUTTER.

Made by the BRIDGEPORT MACHINE TOOL WORKS, Bridgeport, Conn.

the bolt to be threaded, which is placed on centres, may be moved into the die head until the dies take hold.

Immediately behind the die head, and fitted to the spindle, is a cam, the position of which determines the opening and closing of the dies. This cam turns with the spindle, except when prevented by the engagement of a trip lever with one of the four notches cut in the collar.

This lever is shown in front of and parallel with the main spindle. It is connected at one end with a latch, which is opened by means of the adjustable stop on the rod when the proper length of thread is cut, while the other end runs back to a point at which it may be acted upon by a cam formed inside the large gear wheel.

A bolt having been turned and placed between the centres it is moved by the operator until the dies take hold, when it feeds itself, as in an ordinary bolt cutter. When it reaches the point desired, the stop on the rod trips the latch, and consequently the lever, by means of a spring, is moved inwards until it engages with one of the notches upon the cam, hold it from rotating and thus opening the dies. After the dies are opened the operator runs the bolt out. The lever still continues to hold the cam until the dies are closed again, and, at the proper time, the cam formed in the gear wheel forces the lever out of the notch, allowing the cam to again revolve with the spindle, the lever being held in position by the latch before mentioned.

The cone pulley is placed inside the frame of the machine directly under the spindle, and is connected therewith by gearing. Six changes of speed are provided for.

The machine is furnished with 9 sets of dies to cut bolts from $\frac{1}{8}$ in. to $1\frac{1}{2}$ in. diameter, and the same number of nut and master taps.

Stay-bolts or special threads can also be cut by suitable dies or taps. It is claimed that with this machine the work usually done on a lathe can be finished in from one-sixth to one-tenth the time and a better finished bolt turned out. The machine can therefore be used advantageously by manufacturers of locomotives, steam engines and others requiring a large number of finished bolts.

The common or rough bolts can also be cut on this machine by simply removing the tail stock and a simple adjustment of other parts.

Uniform Method of Settling Freight Accounts.

The growth of the practice of billing through, together with the increase of new roads and of the extent of old ones, has brought to the attention of the freight auditors with increased force the necessity of reforming out of existence the perplexing variety of plans in use for making settlements of joint freight accounts. All sorts of methods are in use, and the result is not only confusion but much needless delay. A number of Chicago men have therefore called a meeting at the Grand Pacific Hotel, Chicago, Dec. 7, 10 a. m., to consider methods and agree upon some uniform plan. All auditors in the United States are invited, and requested to bring their freight auditors with them. The call is signed by the undermentioned gentlemen, and they request that every one come, if possible, with authority to agree officially to the action of the meeting.

J. P. Whaling, General Auditor Chicago, Milwaukee & St. Paul; Morris Trumbull, Auditor Wabash Railway; J. C. Welling, General Auditor Illinois Central; John L. Lathrop, General Auditor Chicago, Burlington & Quincy; D. B. Howard, Auditor Wabash Western; Erastus Young, Auditor Union Pacific; W. G. Purdy, Vice-President Chicago, Rock Island & Pacific; Lewis A. Robinson, Auditor Chicago, St. Paul, Minneapolis & Omaha; C. G. Warner, General Auditor Missouri Pacific; D. A. Waterman, Auditor Michigan Central; T. J. Hyman, Auditor Minneapolis & St. Louis; M. M. Kirkman, Comptroller Chicago & North-western.

The Curtis Frost Proof Trap.

The accompanying engraving represents a section of a frost proof trap recently introduced by the Curtis Regulator Co., of Boston, Mass.

Any trap exposed to zero weather will freeze, provided water remains in it or trickles into it after steam is shut off and the trap is cooled down to the freezing point.

Water will remain in any trap unless an opening is made in the top to let in air and destroy the vacuum occasioned by the condensation of steam in the trap and pipes. If water trickles into the trap after steam is shut off, it will freeze up the outlet, even if the valve is wide open.

The trap shown in our illustration is provided with two ample outlets, one in the top and one in the bottom, with a valve

in each automatically controlled by the temperature in the trap body. When steam is shut off the trap rapidly cools, opening first the lower outlet wide, and at 170 degrees or less opening the upper outlet, creating an inlet for air, and thus preventing the formation of a vacuum, and allowing all the water in the trap to fall instantly out. If after this water trickles into the trap from the condensation of the steam remaining in the pipes, and freezes the lower outlet, the upper outlet remains open, and when the steam is again let on, provides for a circulation through the pipes and trap until the lower outlet is thawed and resumes its office, then this upper outlet closes by reason of the increased temperature in the trap.

The operation of the trap is as follows: When cold, both valves are wide open, the stiff spring forcing them from their seats and pushing the flexible surface of the expansion vessel back to its furthest limit. So long as the contents of the trap are cold, the valves are wide open. Steam being let on, all the air and water passes out freely until the temperature in the trap approaches the point at which it is set to close.

At this point the pressure in the expansion vessel becomes sufficient to force the valve towards its seat, and thus diminish the flow of water, delivering it only at the temperature at which the trap is set to close. The valve controlling the upper outlet is set to close at 180°, and closes long before any steam reaches the trap, thus leaving the lower outlet, which is set at 210°, to control the flow of condensation, either outlet being extra large for any service that may be required of the trap. When steam is cut off from the pipes and the temperature falls 10°, the bottom valve is wide open, letting the water out instantly; and when the temperature falls to 170°, the upper outlet opens, thus providing an inlet for air to destroy any vacuum which may tend to form in the trap or pipes.

If the lower outlet becomes closed by ice, the upper outlet is wide open, and provides for the circulation (when steam is again let on), until the lower valve is thawed out; the rising temperature closes the upper valve, leaving the lower to take care of the condensed water.

By this arrangement it is claimed that circulation is in-

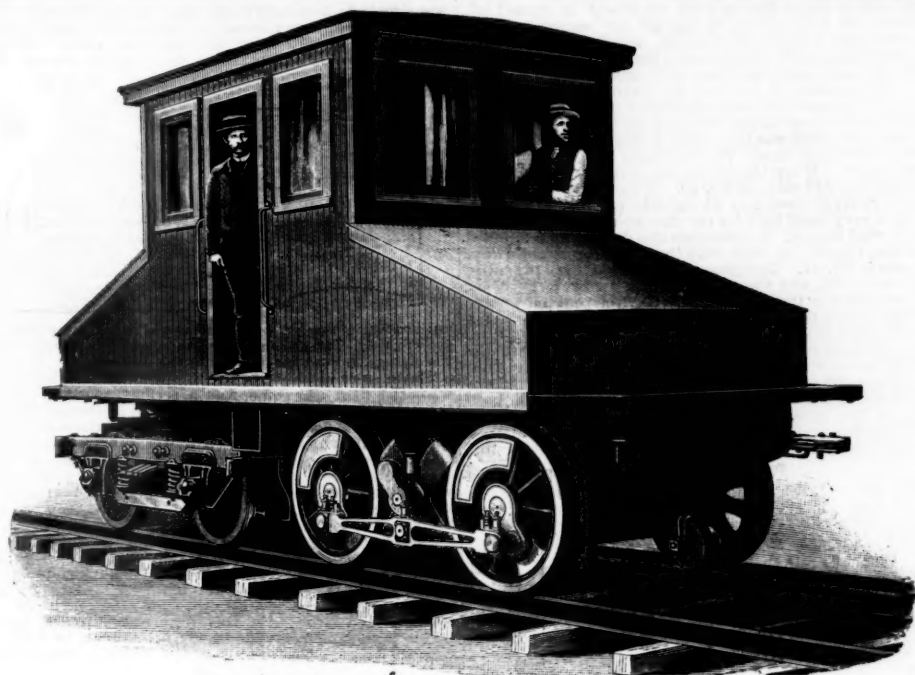
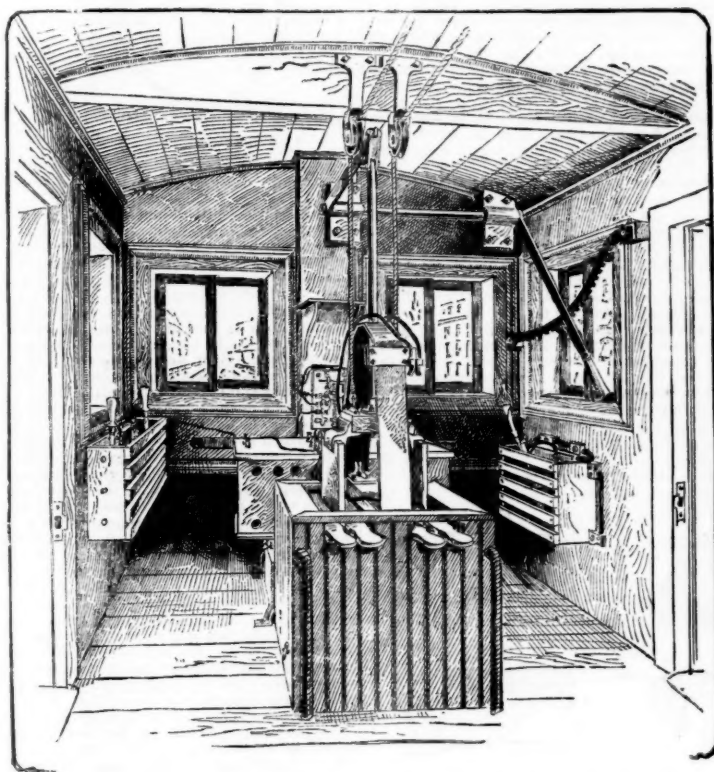


Fig. 1.—Perspective View.

Fig. 2.—Interior of Cab.
FIELD'S ELECTRIC LOCOMOTIVE.

sured under any circumstances. There is no loss of steam at the top, as it is set to close and closes at 180° or less. Another valuable feature of the trap is the large inlet area, being tapped for 1½ inch pipe, thus providing against the inlet pipe being frozen by the trickling water.

We are informed that similar traps have in use for three and a half years and are giving satisfaction, both for accuracy and durability. It is claimed that this trap is especially well adapted to railroad service, as the constant jar and rattle produces no disturbance whatever of their full efficiency.

The Field Electric Locomotive.

For several months past Mr. Stephen D. Field has been engaged in the completion of an electric locomotive designed for use on the elevated railroads of this city, and within the last few weeks it has been in operation on the Thirty-fourth street branch of the New York Elevated Railroad. The locomotive as it stands upon the track is shown in the accompanying engraving, Fig. 1. The motor is mounted upon the rear truck, and the distinguishing feature is its mode of connection with the drivers. The arrangement, as will be seen, is exactly similar to that employed in the ordinary steam locomotive, and consists in the direct connection of the motor shaft with the drivers by means of a crank and side rod. The great advantage of this arrangement in the electric locomotive over the steam locomotive is apparent when we consider that in the latter the maximum effort is exerted on the drivers when the cranks stand vertically either above or below the centre, and when on the centres no effort whatever is exerted. In the electric locomotive, however, the armature exerts a uniform and continuous effort upon the

side bar, which is transmitted directly to the drivers, no matter what the position of the cranks may be. It follows from this that the starting up is much quicker than in the case of the steam locomotive, where the power of only one cylinder is available at a time.

The motor, which is series wound, is regulated by means of a liquid rheostat placed in the cab of the locomotive, shown in fig. 2. This rheostat consists of a trough divided into two compartments filled with acidulated water. A metal plate on either side of these troughs acts as a terminal for the circuit, which is led in by the two cables shown. The speed of the motor is regulated by inserting or withdrawing from the troughs two slabs of slate, which are suspended over the troughs and can be raised or lowered by means of the long lever traveling over the sector shown at the right in the cab. By means of this liquid rheostat the resistance can be graduated from practically nothing, *i. e.*, when the slabs are fully drawn up, to an infinite resistance when completely lowered into the troughs. On the standard which guides the slabs there will be seen a spring clip, and on the right-hand slab a plug. This is so arranged that when the slabs are full up the plug presses between the spring clips and cuts out the rheostat entirely. The reversing switch, for reversing the direction of the motor, is shown in the lower right-hand corner of the cab.

In designing the locomotive Mr. Field constructed special brush shifting apparatus for preventing sparking at the commutator with change of speed and load. This consisted of a small motor which shifted the brushes in accordance with the action of a relay in circuit with the terminals of two auxiliary brushes placed at the neutral points on the commutator. Actual practice, however, has shown that this refinement of brush regulation was unnecessary, the brush lead under the influence of the peculiar speed regulation employed having been found to remain fixed and at an angle of 45 degrees; this, no doubt, being due to the large mass of iron employed in the construction of the field and armature.

The following table gives the weight and dimensions of the locomotive:

Weight of motor.....	9 tons
" armature.....	1 ton
" wire on armature.....	600 lbs. No. 7
" field magnets.....	1,600 lbs. No. 4
Total weight of motor, car and forward truck..	13 tons
Diameter of drivers.....	3 ft.
" armature.....	2 ft.
Length of armature.....	42 in.
Wheel base.....	5 ft.

The track on which the motor was operated is one of the steepest grades in the city, on which account it was peculiarly well adapted to show up any weakness in the system employed. One passenger car forms a load for a 13-ton steam locomotive regularly employed.

The motor easily drew one of the regular coaches up this grade at a speed of about 8 miles per hour, with a current expenditure of 35 amperes under an E. M. F. of 800 volts. The loss in conversion was found to be very small.

Various potentials were at times employed, 1,100 volts being used at one time with the same freedom from sparking as with the lower potential, the only change noticed being an increased speed of the motor.

The generating plant was situated at a distance of half a mile from the track, and consisted of a single dynamo, built by Mr. Rudolph Eickemeyer, of Yorkers, in whose shops, also, the locomotive was built. This generator is of the iron-clad type, and showed itself fully capable of handling the load placed upon it.

The tests made, which extended over several weeks, have so thoroughly convinced Mr. Field of the practicability of the new ideas embodied in this motor that he is now preparing to demonstrate with apparatus on a large scale the practicability of electricity as a motive power for the elevated railways of this city. Among the other novelties embodied in the motor is the "pick-up" wheel of Mr. Field, which operates admirably, so that no sparking whatever can be observed.—*Electrical World.*

New England Railroad Club.

The regular monthly meeting of the Club was held Wednesday evening, Nov. 9, at the rooms in the Boston & Albany passenger station. The subject for discussion was Material for Axles, Journal Bearings and Lubrication.

In opening the meeting, President Lauder read a letter from the Westinghouse Air Brake Co. inviting the members of the Club to be present at the tests to be made near Boston next Monday. Mr. Lauder expressed the hope that all who could would accept the invitation in view of the importance of the tests.

A communication from the Western Railway Club was then read announcing the appointment by that club of a committee to confer with representatives of other clubs and of the Pullman Co., with the end of deciding on a uniform standard coupling for continuous car heating systems. The Club was asked to appoint representatives to this conference. On motion of Mr. Stewart, the President appointed as this committee: F. D. Adams, of Boston & Albany; J. W. Marden, of the Fitchburg, and Albert Griggs, of the Providence & Worcester.

After considerable debate, it was voted that the question of "Continuous Brakes for Freight Trains" be adopted for discussion at the December meeting.

It was voted that in future some person be appointed by the President to take into consideration the subject for the next meeting and open the discussion.

Considerable talk was then had regarding the inviting of superior officers, presidents, general managers and superintendents to the meetings of the Club. It was the general feeling that it would be very agreeable to the members if this could be accomplished.

Mr. Marden then opened the discussion of the subject before the meeting. He thought the journal should be 4 x 8 in., and the axle 4½ in. diameter at the middle, and further discussed the material for axles.

Mr. Coney thought that in the matter of axles one important fact had been lost sight of, which was that axles were made of scrap, and sold to-day as low as 2½ cents per pound. He then defined scrap as "anything a forge man saw fit to buy," and explained the difference between axles made from fagots of new material and scrap.

President Lauder then described the journal box designed by Mr. Jacob Johann, of the Texas Pacific, and said that his road (Old Colony) is using it, and finds it very satisfactory. He advocated larger axles.

Further remarks were made by Mr. Shinn, Mr. Adams, Mr. Coney, Pres. Lauder, and Mr. Howard, of the Watertown Arsenal, when the meeting adjourned.

The Change of Gauge of Southern Railroads in 1886.

(Continued from page 668.)

It was decided that the "gauge" rail was the one to be moved. On lines without curves, or with very few, this was undoubtedly correct; but where curves were frequent and long, some provision must be made to overcome the "crowding." The committee recommended that the track be thrown out. The tendency of trackmen is so strong to run the tangent into the curve, and so much of our line was curved (45 per cent. upon one division, a large part of the curves being 6 degrees and upward), we felt that we must have some other remedy.

Fig. 10 gives an idea of the plan of the committee. It was

FIG. 10

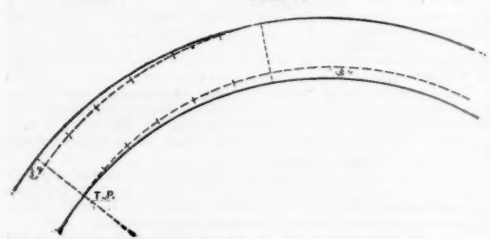


claimed that we could cut rails so as to leave room; but our grades were high, and we felt that in the days that would elapse between any such preparation and the day of change our track would "run," as in fact it did constantly. We thought June 1 would be hot, and thus any gap we might calculate upon surely be closed up. All this, of course, where the outside rail was the one to be moved. It seemed better to us to change sides, and in all cases to move the inside rail. To do this we would change the "gauge" rail up to the tangent point the regular 3 in., the joint first beyond the tangent point (which we will assume at a joint nearest the actual T. P.) we will throw in 2½ in., while the other rail will come in ½ in.; the second joint in same way will go in 2 in., while the opposite rail comes in 1 in.; at third joint the distances will be 1½ and 2½ in.; at the fourth joint, 1 and 2 in.; at the fifth joint, ½ and 1½ in.; at the sixth joint our outside rail will not move at all, while the inside rail will come in the full

* By C. H. Hudson, member of the Western Society of Engineers. Reprinted from the *Journal of the Association of Engineering Societies.*

3 in.; we continue to move the inside rail till within six joints of the next tangent point, when we commence to reverse the process. In the process of preparation spikes have been driven at each of the points mentioned. Fig. 11 shows

FIG. 11

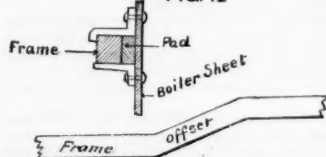


this plan. The outside or elevated rail is the one usually used as the line rail upon a curve, so we were following the plan on which we started, viz.: to move the "gauge" rail. The wisdom of the plan was shown when the day of change came and curves changed on this plan were found to be in better line than those changed by any other method. We tried all three plans spoken of.

In the matter of locomotives the conditions varied much. Of the engine builders, the Baldwin Locomotive Works had probably been the most far-seeing. For twenty years they had looked forward to this change, and had during that time so constructed their frames and fire-boxes that, by using new driving wheel centres, the change could be made without changing other parts. Few other builders had, until comparatively recently, given the matter any thought, and, as a result, many engines were found that could be changed only by moving the frames in, and not unfrequently the fire-box had to be altered; this meant a new fire-box and heavy expense. Many engines were thrown out of service by the fact of the great cost of changing them.

The 5-ft. engines measured between flanges of drivers (and other wheels as well) 4 ft. 8 1/2 in. As the gauge was narrowed 3 in. it followed that the new measurement would

FIG. 12



be 4 ft. 5 1/2 in., and this in fact was the measure fixed upon by the convention, with a limit of variation of 1/2 in. either way; so the frames must be enough less than this from out to out to give a reasonable clearance, or say 4 ft. 5 in. I think all our Baldwins was within this limit; but we found other engines wider from out to out of frames, the frames being set out from the fire-box and a "pad" placed between them; see fig. 12. The "pad" could be cut out and the frame set in against side of the fire-box; but to do it, this frame had to be offset, as shown in fig. 12. This was done behind the rocker arm and in front of the pedestal or "jaw" thus rendering unnecessary the changing of machinery, but enabled us to set in the boxes and wheels or tires to the proper width without cutting into the frame.

To get proper information about all the engines, accurate measurements were taken of width of fire-box, width between frames, from out to out frames, between hubs, between inside of tires, between rims of wheels, sizes of boxes and wedges, thickness of hubs, rims of wheels, etc. Blue print diagrams were prepared upon which were placed all these measurements with the number of the engine. From these the head of the machinery department could see at a glance what was required for each engine. It was expected at the start that new driving wheel centres would be required for all engines; but examination of our blue prints showed that upon our lines, at least in a majority of cases, this was not necessary. Some few engines, notably some of the old Rogers, had wheels that were dish'd to such an extent that by pressing them off and putting on again, with the outside face inside, an inch and a half could be gained and the tire could go on as originally placed, squarely upon the wheel. See fig. 13 as originally, and fig. 14 as turned. It was found in practice that a new crank pin had to be put in. In many cases we found that we had thick hubs and heavy flanges to both driving boxes and wedges, so that by taking from 1/2 to 3/4 of an inch from the insides of the hubs, and 1/2 to 3/4 from the box and wedge flanges, we could gain at least one inch, and in some cases did more. This left not to exceed half an inch for the tire to project over the wheel centre on the inside, neither an unreasonable nor an unusual projection. This change was a trifling one and done at a cost per engine of about \$130.67, including new crank pins. A new set of wheel centres, finished and in place, including pins, which would probably be needed, would cost \$264.46. When changes were decided upon, and an engine was in the shop, they were made, and the tires were then put on at the old gauge, projecting outside the centre. They

FIG. 15

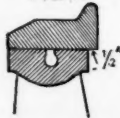


FIG. 17



FIG. 19

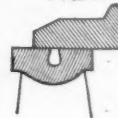


FIG. 16



FIG. 18

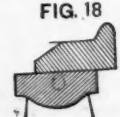


FIG. 20



were used in this way without trouble until the day of change came; fig. 15, original; fig. 16, changed. Some of the more recent engines had their wheel centres built expressly with a view to changing. They were placed upon the axle, and would be required with the new gauge; but the rim projected outwardly an inch and a half more than usual, so that the tire could be placed for the 5 ft. gauge and still have its full support. See fig. 17. When the tire was eventually moved

to the narrow gauge this outward rim would be turned off. Of course, we were not able to take all our engines into the shop and press in their wheel centres, and had to be satisfied with some temporary arrangements that would give us the use of the engine until such time as it could be taken into the shop. We decided to set tires in, leaving the centres unchanged. This gave an inside projection of 1 1/4 in., plus what little projection there might have originally been. When the rim was solid, there was no trouble in this (fig. 18), provided the tire was not too thin. We fixed upon 2 in. as a limit safe beyond doubt. When the coring was in the middle and not large this was still safe, see fig. 19. We sometimes, however, found very large cores, and at one side (see fig. 20), which gave us a very small hold for our tire, and it was not deemed safe for road service. To overcome this danger we purchased a few new tires 6 3/4 in. wide with the outer corner cut away, as shown in fig. 21. This gave us a bearing over the entire rim of the wheel, and was safe, no matter how large or in what position was the core. The corner was cut off to save material, and at the same time, to save the bad effects of a wide tire upon frogs and switches. The edge was left 1 in. thick. At some future time when the engine goes into the shop and has new centres put on, or the old ones pressed in, this extra width of tire can be turned off.

As to engine trucks: The frames had, in many cases, been made of the proper width for the narrow gauge, and the wheels had been built with a heavy hub projecting an inch and a half inward (fig. 22), so that it would bear against

FIG. 21



FIG. 23



FIG. 24



FIG. 25



FIG. 22



the truck box. It was expected that these wheels would be taken out and 1 1/4 in. of the hub taken off when the change came, so that the wheel could be pressed on the new gauge. This would have taken too much time, so the inch and a half extra hub was left off of all new wheels, but a cast iron collar or washer 1 1/4 in. thick was placed upon the axle inside each wheel and between it and the box (fig. 23). When the day of change came a few blows of the hammer upon a cold chisel split this collar off and we were ready to press the wheel the needed inch and a half upon the axle.

Many of the wheels that were still in use with the long hub were put into a lathe and a groove was cut an inch and a half back from the face, leaving our cast collar, which was easily split off as before. (Fig. 24.)

With tender wheels, as with our car wheels, the case was different. Originally, the axle for the 5-ft. gauge was longer than for the 4 ft. 9 in.; but latterly the 5-ft. roads had used a great many Master Car-Builders' axles for the 4 ft. 9 in. gauge, namely, 6 ft. 11 1/4 in. over all, thus making the width of the truck the same as for 4 ft. 9 in. gauge. To do this a dish'd wheel, or rather a wheel with a greater dish by 1 1/2 in. than previously used was needed, so that the tread of the wheel could be at its proper place; see fig. 25. There were, of course, many of the wheels with small dish and long axles still in use. Their treatment, however, when the day of change came, did not vary from that of the short axles. It had been the rule for some years that all axles should be turned back 1 1/2 in. further than needed; but unfortunately the rule had not been closely followed, and many were found not to be so turned. To make the matter worse, quite a number of the wheels were found to have been counterbored about 1/2 in. deep at the back end, and the axle turned up to fit this counterbore; a good idea to prevent the running in, in case the wheel worked loose, but bad from the standpoint of a

FIG. 26

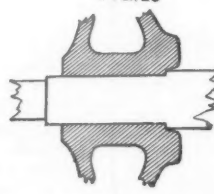


FIG. 27

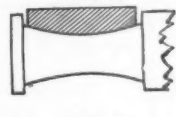
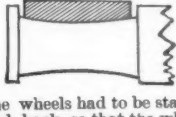


FIG. 28



change of gauge. In such cases the wheels had to be started off before the axle could be turned back, so that the wheels could be pushed on in their proper position. (Fig. 26.) If the work was done where they had a lathe large enough to swing a pair of wheels, they were pressed off but half an inch, the wheels swung in the lathe, the axles turned back 1 1/2 in., and the wheels then pressed on 2 in. or 1 1/2 in. inside of their first position. Where no large lathe was in use, the wheels came entirely off before the axles could be turned back. The work in the former case was both the quicker and the cheaper. Where the large lathes were used they were either set down into the floor, so a pair of wheels would easily roll into place, or a raised platform was put before the lathe, with an incline up which the wheels were rolled and then taken to the lathe. These arrangements were found much quicker and cheaper than to hoist the wheels up, as is usually done. Impressing the wheels on, where the axles had previously been turned back, much trouble was at first experienced because of the rust that had gathered upon the turned part behind the wheel, forming a ridge over or upon which the wheel must be pushed. Some of the roads, at the start, burst 10 or 15 per cent. of the wheels so pressed on. By saturating this surface with coal oil, however, it was found that the rust was easily removed and little trouble was had. It was found, sometimes, that upon axles newly turned back a careless workman would leave a ridge at the starting point of the turning. Frequently, also, the axles were a little sprung, so that the new turning would be a little scant upon one side when compared with the old surface, and upon the opposite side a little full. As an indication that these difficulties were overcome as they appeared, I will say that upon our line only 202 wheels burst, out of nearly 27,000 pressed on, an exceedingly small percentage.

After the change upon the early roads they were troubled for weeks with hot boxes, caused, as we believed, by the changing of brasses. A brass once fitted to a journal will work upon it without trouble; but when placed upon some other journal will probably not fit. If the journal had been worn hollow (and it was surprising to see how many were so worn), the brass would be found worn down to fit it. See fig. 27, exaggerated of course. The next wheel may have an axle worn little or none, as in fig. 28. Now, if these brasses are exchanged, we have the conditions, as shown in figs. 29 and 30, and we must expect they will heat. The remedy

was simply to keep each brass upon its own journal. To do this the brasses were fastened to the axle by a piece of small wire, and went with it to the lathe and press. When its truck was reached, the brass was there with its journal. Worn

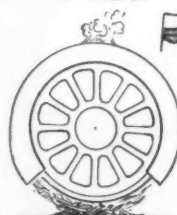
FIG. 29



FIG. 30



FIG. 31



out brasses, of course, could not be put in, and new ones were substituted. The little trouble from that source that followed the change showed the efficacy of the remedy.

The manner in which the tires of engines were to be changed, when the final day came, was a serious question. The old fashioned fire upon the ground could not be thought of. The Mobile & Ohio had used a fire of pine under the wheel, which was covered by a box of sheet iron, so arranged that the flame and heat would be conveyed around the tire, and out at an aperture at the top; fig. 31. Many thought this perfect, while others were not satisfied, and began experiments for something better. A device for using gas had been patented, but it was somewhat complicated, as well as expensive, and did not meet with general favor. A very simple device was soon hit upon. A two-inch pipe was bent around in a circle a little larger than the outer rim of the wheel. Holes 1/2 inch in diameter and 3 or 4 inches apart were drilled through the pipe on the inside of the circle. To this pipe was fastened another with a branch or fork upon it. To one branch or fork was connected a gas-pipe from the meter, while to the other was

FIG. 32

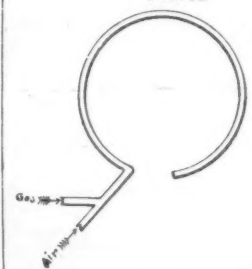
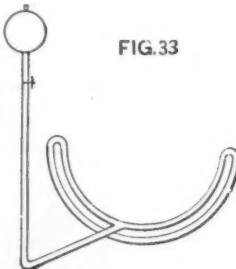


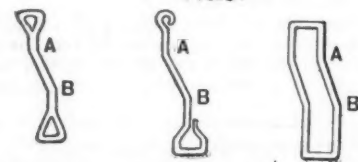
FIG. 33



connected a pipe from an air-pump. With the ordinary pressure of city gas upon this pipe it was found that the air-pump must keep an air-pressure of 40 lbs., that the air and gas might mix properly at the branch or fork, so we could get the best combustion and most heat from our "blow-pipe," for such it was. See fig. 32. We were able to heat a tire so it could be moved in ten to twenty minutes, and the machine may be said to have been satisfactory. Gas, however, was not to be had at all places where it would be necessary to change tires, and the item of cost was considerable. To reach a result as good, if possible, experiments were begun with coal oil (head-light oil). They were crude and unsatisfactory at first, but soon success was reached. A pipe was bent to fit the lower half of a wheel pretty closely, and then turned back under itself about the diameter of the pipe distant from it. This under part had holes 1/2 in. in diameter and 3 or 4 in. apart, drilled upon its upper side, or under the upper pipe. Connected with the upper pipe at its centre was a pipe which ran to one side and up to the can containing the kerosene. Between the can and the pipe under the wheel was a stop-cock by which the flow of oil could be controlled. To use the device, open the cock and let a small amount of oil flow; apply fire to the pipe under the wheel, and the oil in the upper pipe is converted into gas, which flows out of the small holes in the lower pipes, takes fire and heats not only the tire, but the upper pipe, thus converting more oil into gas. We had here a lot of blue flame jets and the same result as with gas, but at less cost. We had also a machine that was inexpensive and easily handled anywhere. Boxes were placed over the upper part of the wheels, that the heat might pass close to the tire. This device was extensively used by our people, and with great satisfaction. Care had to be taken that in starting the fire it did not smoke and cover the tire with carbon or "lampblack," which is a non-conductor of heat. Experiments were made with air forced through gasoline, and with oil heated in a can to form gas. There was more danger in either of these than with our blow-pipe device, and no better results were obtained, though the cost was greater.

With the change of the wheels, the brakes had to be changed the same amount, that is, each one set in 1 1/2 in. This it was thought would either require new hangers, or a change in the head or shoe in some way. We found that the hangers could easily be bent without removal. Fig. 34 shows three hangers after passing through the bending process. A short lever arranged to clasp the hanger just below the point

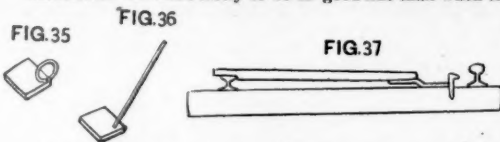
FIG. 34



A was the instrument. A forked "shoe" is now placed, with the fork against the point A, and the other end against the car sill; press down on the lever and you bend the hanger at A; lower the lever to a point just below B, reverse the process and you have the bend at B; the whole thing taking less than two minutes per hanger. A new bolt hole, of course, has been bored in the brake beam 1 1/2 in. inside the old bolt. It takes but a short time after this to change the position of the head and shoe.

Before the day of change, a portion of the spikes were drawn from the inside of the rail to be moved, and a spike set 3 in. inside of the rail. As a rule two spikes were drawn and the third left. At least every third spike was set for the new gauge, and in some cases every other one. There were several devices with which to set the spike. A small piece of iron 3 in. wide was common, and answered the purpose well. This had a handle, sometimes small, just large enough for the hand to clasp, while others had a handle long enough for a man to use it without stooping down. See figs. 35 and 36. Another device is shown in fig. 37, so arranged that the meas-

measurements were made from the head of the other rail. This was liked best, and, it is thought, gave the best results, as the moved rail was more likely to be in good line than when the



measurements were taken from the flange. It was intended that great care should be taken in driving the spikes, that they were in the proper place, square with the rail, and left sticking up about an inch. The ties, of course, were all adzed down before the day of change.

Hand-spikes were originally used to throw the rails, as were lining bars. We found, however, that small cant-hooks were more easily handled and did better work. The first were made like fig. 38, with a spike in the end of a stick, while the hook was fastened with a bolt about 10 or 12 in. above the foot. We afterward made them of a 1 1/4 in. rod, 3 1/2 feet long, pointed at one end, with a ring shrunk on 1 foot from the bottom. Then the hook was made with an eye, as shown in fig. 39, which slipped down over the top of the main rod. This was simple and cheap, and the iron was to be used for repair purposes when this work was done.

Upon the system with which the writer was connected we had some branches where we could experiment upon the moving of the rail. Between Selma and Lauderdale the traffic was light, and at Lauderdale it connected with the Mobile & Ohio Railroad, which was narrow, and to which all freight had to be transferred, either by hoisting the cars, or by handling through the house. By changing our gauge we would simply change the point of transfer to Selma. Here was a chance to experiment upon one hundred miles and cause little trouble to traffic. We could see the practical workings of our plans, and, at the same time, leave less to do on the final day. Upon the 20th of April we did this work. It had been our plan to do it somewhat earlier, but floods prevented. Most of the rail was old chair iron, short, and consequently more time was used in making the change than would have been required had our work been on fish plate rail. Our sections here were about eight miles long, and we arranged our men on the basis blocked out by the committee, viz.: 24 to 26 men to the section, consisting of 6 spike pullers, 4 throwing rails, 12 spikers, 2 to push the cars and carry water.

We soon found 5-ft. cars useless and threw them into the ditch to be picked up at some future time.

The men were spread out so as not to be in each other's way, and, when the organization was understood and conformed to, it worked well. One gang changed 5 miles in five hours and ten minutes, including a number of switches. We found, however, and it was demonstrated still more strongly on later work, that after 5 or 6 miles the men began to lag. We believed we had the best results when we had sections of about that length. It was arranged that two sections, alternately, commenced work together at one point, working from each other and continuing until the force of another section was met, working from the opposite direction.

The foreman in charge was expected to examine the work and know that all was right. The push car which followed was a good test as to gauge. A work train was started from each end with a small force (20 or 25 men) to run over the changed track. This train, of course, had been changed on a previous day to be ready for this work. If a force was overtaken by this train with its work not done, the men on the train were at once spread out to aid in its completion. This done, the train ran on. Not until this was done was a traffic train allowed to pass over the track. The same rule was followed upon all the work. Upon the final day it was required that upon all high trestles and in tunnels the track should be full spiked before being left, or a train let over. This took extra time and labor, and possibly was not necessary; but it was a precaution on the side of safety.

Upon the day of the change of the Alabama Central Division (Selma to Lauderdale), superintendents of other divisions, with their road masters, supervisors, master mechanics and many section foremen, were sent over to see the organization and work and the preparations that had been made. Many of them lent a helping hand in the work. They saw here in practice what had only been theory before. About a week before the general change that portion of the road between Rome, Ga., and Selma, Ala., about 300 miles, was changed, and again men from other divisions were sent to see and aid in the work; so when the final day came the largest possible number of men were able to work understandingly.

On the last day of May the Memphis & Charleston, Knoxville & Ohio, and North Carolina Branch were changed, and on June 1 the line from Bristol to Chattanooga and Brunswick. Other roads changed their branch lines a day or two before the 1st of June; but the main lines, as a rule, were changed on that day.

It was no small matter to take care of the cars and arrange the train service so there should be no hitches. It was not expected that connections would move freight during the 48 hours prior to the change, and these days were spent in clearing the road of everything, and taking the cars to the points of rendezvous. All scheduled freight trains were abandoned on the day prior to the change, and only trains run to such points. Upon the East Tennessee system these points were Knoxville, Rome, Atlanta, Macon, Huntsville and Memphis, and to these points all cars must go, loaded or empty, and there they were parked upon the tracks prepared for the purpose. Passenger trains were run to points where it had been arranged to change them, generally to the general changing point. Most of the Southern roads have double daily passenger service; upon all roads one of these trains, upon the day of change, was abandoned, and upon some, all. Some, even, did not run till next day. We were able to start the day trains out by 10 o'clock or 11 o'clock a. m., and put them through in fair time. Of course, no freights were run that day, and the next day was used in getting the cars which had been changed, out of the parks and into line. So our freight traffic over the entire South was suspended practically three days.

The work of changing was to commence at 3:30 a. m., but many of the men were in position at an earlier hour and did commence work as soon as the last train was over, or an hour or so before the fixed time. Half-past three a. m., however, can be set down as the general hour of commencement. For five or six hours in the cool morning the work went on briskly, the men working with much more than ordinary enthusiasm; but the day was warm, and after 9 or 10 a. m. it began to lag. All was done, however, before the day was over, and safe, so that trains could pass at full speed. The men all received \$1.50 for the work, whether it was finished early or late in the day, and were paid that afternoon as soon as the work was done. Tickets were given the men, which the nearest agent paid, remitting as cash to the treasurer.

On some lines it was deemed best to offer prizes to those

who got through first. Reports showed some very early finishes; but the facts seem to have been that under such encouragement the men were apt to pull too many spikes before the change and put too few in while changing. They were thus reported through early, but their work was not done, and they took great chances. It was by most considered unwise to offer such prizes, preferring to have a little more taken and be sure that all was safe. Such lines seemed to get their trains in motion with as much promptness as others. This, with freedom from accident, was the end sought.

It was found after the work had been done that there had been little inaccuracies in driving the gauge spike, to which the rail was thrown, probably from various causes. The rail to be moved may not always have been exactly in its proper place, and then the template in the hurry may not have been accurately placed, or the spike may have turned or twisted. Whatever was the cause, it was found that frequently the line on the moved side was not perfect, and, of course, many spikes had to be drawn and the rail lined up and re-spiked. The more careful the work had been done, the less of this there was to do afterward. With rough track this was least seen. The nearer perfect the more noticeable it was.

Of course, we all planned to get foreign cars home and have ours sent to us; but when the interchange stopped, we found we had many foreign cars, which, of course, had to be changed. This subject had come up in convention and it had been voted to charge \$3 per car when axes did not need turning, and \$5 where they did. By comparison with the cost of changing, as shown in this paper, it will be seen that to our company, at least, there was no loss at these figures.

The following statements will explain the work done upon the Louisville & Nashville, and East Tennessee, Virginia & Georgia systems.

It is to be regretted that the writer has not at hand information regarding other roads that fuller statements and comparisons might be made and the showings be of greater value.

The figures of the Mobile & Ohio are added, having been compiled from the annual report of that road.

MOBILE & OHIO RAILROAD. (Compiled from Annual Report.)				
Engines and tenders	Number changed	Cost of labor	Cost of material	Total Average cost.
Engines and tenders	47	\$8,031.42	\$7,270.86	\$15,302.28 \$325.70
Pass. bag. and ex. cars	55	438.37	104.25	542.62 9.87
Freight cars	1,301	5,719.03	739.57	6,458.60 4.40
M. of W. cars	1,408 1/4			
Freight trucks	107 1/2			
Lever and push cars	143	1,427.55	476.93	1,904.48 13.32
Track (including sidings)	583.5	17,109.53	7,275.14	24,384.67 41.79
Bridges		1,898.69	190.60	2,089.29 3.58
Track tools		170.73	1,405.74	1,576.46 2.70
Shop tools		419.70	2,082.90	2,502.60 5.83
Temporary side tracks	12.09	1,958.94	372.37	2,331.31 192.83
Switching cars		1,398.18	16.50	1,414.68
Car hoists		2,409.38	4,419.34	6,828.72
Total cost		\$41,080.42	\$25,259.60	\$66,340.02
Total average cost per mile				\$113.68

LOUISVILLE & NASHVILLE RAILROAD. (Compiled from Annual Report.)				
Engines and tenders	Number changed	Cost of labor	Cost of material	Total Average cost.
Engines and tenders	180	\$8,227.47	\$2,904.30	\$11,131.77 \$61.82
Pass. bag. and mail cars	168	734.93	59.67	794.60 4.73
Freight cars	5,175	17,425.57	1,224.08	18,649.65 3.60
M. of W. cars	439	2,038.44	549.47	2,587.91 5.88
Track (inc. sidings)	1,532.7	27,718.17	40,912.09	68,630.26 44.78
Bridges	1,532.7	1,808.57	200.00	2,008.57 1.31
Track tools	1,532.7	194.48	2,573.83	2,768.31 1.80
Storage trucks, inc. taking up	37.02	9,825.41	1,481.59	11,307.00 305.44
Shop tools		472.20	2,728.30	3,200.50
Total cost		\$68,445.24	\$52,633.33	\$121,078.57
Total average cost per mile				\$79.06

EAST TENNESSEE, VIRGINIA & GEORGIA SYSTEM. (Compiled from Annual Report.)				
Engines and tenders	Number changed	Cost of labor	Cost of material	Total Average cost.
Engines and tenders	180	\$8,227.47	\$2,904.30	\$11,131.77 \$61.82
Pass. bag. and mail cars	168	734.93	59.67	794.60 4.73
Freight cars	5,175	17,425.57	1,224.08	18,649.65 3.60
M. of W. cars	439	2,038.44	549.47	2,587.91 5.88
Track (inc. sidings)	1,532.7	27,718.17	40,912.09	68,630.26 44.78
Bridges	1,532.7	1,808.57	200.00	2,008.57 1.31
Track tools	1,532.7	194.48	2,573.83	2,768.31 1.80
Storage trucks, inc. taking up	37.02	9,825.41	1,481.59	11,307.00 305.44
Shop tools		472.20	2,728.30	3,200.50
Total cost		\$68,445.24	\$52,633.33	\$121,078.57
Total average cost per mile				\$79.06

COMPARATIVE STATEMENT OF AVERAGE COST OF VARIOUS ITEMS OF WORK.				
	M. & O. R. R.	L. & N. R. R.	E. T. V. & G. R. R.	Average.
Engines and tenders	\$325.70	\$202.58	\$61.82	\$196.70
Pass. bag. and Ex. cars, per car	9.87	5.81	4.73	6.80
Freight cars, per car	4.40	3.60	3.60	3.87
M. of W. cars, per car	13.32	2.72	5.88	7.31
Track (inc. sidings, bridges, etc.), per mile	45.37	47.33	46.09	46.26
Track tools, per mile	2.70	1.31	1.80	1.94
Temporary side tracks, per mile	192.83		305.44	249.13
Total per mile of track, inc. sidings	\$113.68	\$100.67	\$79.06	\$97.80
*Expense not divided as between passenger and freight cars.				
†3.5 per cent. passenger, baggage and express cars; 96.5 per cent. freight cars.				

Since the preparation of this paper the general manager of the Norfolk & Western Railroad has kindly furnished the following items of expense for that line:

	No.	Cost.	Average cost.
Engines and tenders	95	\$37,730.00	\$397.16
Cars (all kinds)	3,615	37,904.65	10.51
Track, miles (including sidings)	507.5		
Labor		25,296.96	
Tools and supplies		3,881.12	
Changing M. of W. equipment		813.13	
Switches		571.67	
Spikes		508.22	
Total track		\$38,721.10	64.80
Total		\$114,445.75	
Total average cost per mile			\$191.53

And the superintendent of the Savannah, Florida & Western has also furnished the expenses for that road:

	No.	Average cost.
Engines and tenders	75	\$76.31
Cars (passenger)	95	4.67
" (freight)	1,133	3.88
Track, including sidings	601.76	44.49

Nothing was said about shop or other tools, storage tracks or changing of maintenance of way equipment.

COMPARATIVE STATEMENT OF AVERAGE COST OF LABOR OF VARIOUS ITEMS OF WORK.				
	M. & O. R. R.	L. & N. R. R.	E. T. V. & G. R. R.	Average.
Engines and tenders	\$170.88		\$45.71	\$108.29
Pass. bag. and ex. cars	7.97	Not divided.	4.58	6.17
Freight cars	3.89	Not divided.	3.36	3.62
M. of W. cars	9.98	Not divided.	4.04	7.31
Miles track (inc. sidings, bridges, etc.)	32.57	34.31	10.76	28.71
Track tools per mile	3.30	Not divided.	1.31	2.21
Temporary tracks	162.63	Not divided.	265.40	213.71
Total per mile of track	\$70.38	Not divided.	\$44.72	\$57.55

COMPARATIVE STATEMENT OF AVERAGE COST OF MATERIAL OF VARIOUS ITEMS OF WORK.				
	M. & O. R. R.	L. & N. R. R.	E. T. V. & G. R. R.	Average.
Engines and tenders	\$154.82		\$16.11	\$85.46
Pass. bag. and ex. cars	1.90	Not divided.	.35	1.12
Freight cars	.51	Not divided.	.24	.37
M. of W. cars	3.34	Not divided.	1.25	2.30
Miles track (inc. sidings, bridges, etc.)	12.80	13.02	30.83	17.55
Track tools per mile	2.40	Not divided.	1.67	2.03
Temporary tracks	162.63	Not divided.	47.04	101.03
Total per mile of track	\$41.30	Not divided.	\$34.34	\$38.82

SUMMARY OF STATEMENTS OF L. & N. AND E. T. V. & G. RAILWAYS.
The mileage changed of the L. & N. and E. T. V. & G. systems combined aggregates 3,622 miles. The total cost of these two roads \$331,492.59. Or an average per mile of \$91.54. Total miles changed was about 14,500 miles. Which would give total cost, at same rate \$1,327,040.

We should really add to this a large sum for the great number of new locomotives which were purchased to replace old ones that could not be changed, except at large cost, and which, when done, would have been light and undesirable.

Upon the basis of the work done upon the Louisville & Nashville and East Tennessee, Virginia & Georgia systems, which combined cover about one-fourth the mileage changed, we have made the following estimates, which will perhaps convey a better idea of the extent of the work than can be obtained in any other way.

Miles of track changed, about	14,500
Locomotives changed, about	1,800
Cars (pass. and freight) changed, about	45,000
New axles used, about	9,000
New wheels used, about	20,000
Axles turned back, about	75,000
Wheels pressed on without turning axles, about	220,000
New brasses used, about	90,000
Kegs of spikes used, about	50,000
Cost of material used, about	\$600,000
Cost of labor, about	730,000
Total cost of work, about	\$1,330,000
Amount expended on equipment, about	650,000
Amount expended on track, about	680,000
Amount expended on track on day of change in labor, about	140,000

The work was done economically, and so quietly that the public hardly realized it was in progress. To the casual observer it was an every-day transaction. It was, however, a work of great magnitude, requiring much thought and mechanical ability. That it was ably handled is evidenced by the uniform success attained, the prompt changing at the agreed time, and the trifling inconvenience to the public.

A Railroad in the Arctic Circle.

The Swedish & Norwegian Railroad, which is now building from Lulea, on the Gulf of Bothnia, to Lofoden, on the North Sea, is partly situated within the Arctic circle, and is 1,260 miles further north than any railroad in Canada. The winter has not, however, been found too severe by the English employes and their wives, and the snowfall is less than in some more southern latitudes, while the darkness of the long winter nights is partly compensated by the light of the Aurora. The line is being built by an English company in order to tap the enormous deposits of iron ore in the Gellivara mountains. It is feared that the ore in the Bilbaco district is nearly exhausted, and as this is the main source of supply for many steel works in the United States and Europe, a new field of non-phosphoric ore suitable for steel rail making is very desirable. A considerable demand exists already for the Gellivara ore, and hydraulic machinery capable of delivering on board ship 10,000 tons of ore in 24 hours is being installed on the company's wharf at Lulea. The engines and cars used have been built in England. The former have eight coupled wheels and weigh 127,000 lbs. in working order. The ore cars are made of steel throughout and are of 56,000 lbs. capacity.

A New Depot at Hartford, Conn.

Work has just been commenced on the new passenger depot at Hartford, Conn. The building is situated north of Asylum street, and is 500 ft. long and built of stone. The external appearance of the station will be attractive, but special pains have been taken with the interior fittings and arrangements, which are carefully designed to render the station commodious and convenient. The central waiting room is 175 ft. by 80 ft. and is 28 ft. high, and will be all open, with wainscotted walls and paneled ceiling. It will exceed in size the hall of the New Haven station. The floor of the hall will be on the street level, and broad and easy stairways, in addition to an elevator, will afford access to the track level on the floor above. It is estimated that the room if used as a public hall would seat 2,000 persons.

The building will also contain a regular restaurant and lunch counter, baggage and express rooms, waiting rooms, retiring rooms, etc., and also rooms on the second or track floor, making the completed outfit of a well appointed station. The building is to cost \$150,000 to \$200,000.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The call for a meeting of Accountants at Chicago, which is given in another column, is of importance because the evil it aims to cure is a serious one, while at the same time it is, or ought to be, easily remediable. The passenger men have a much more simple and sensible method of settling with foreign roads for through business; but they have a great advantage in the fact that the money is always collected in advance. Freight settlements are often made in the manner which promises to be the least expensive in the amount of money locked up for a longer or shorter time, without regard to whether the method is theoretically the best or not. Where the interest on a few thousand dollars for a week or a month is at stake, the average general manager takes but a languid interest in uniformity.

The Westinghouse Trials.

The table on another page shows the results obtained at six different points with the Westinghouse experimental train. The figures give the results that would be obtained on a level grade at the nominal speeds (20 and 40 miles per hour) at which the tests were to have been made, the effect of the actual grades and speeds being corrected and allowed for. It will be seen that as usual with the Westinghouse brake, the results are remarkably even. The short stops effected are very remarkable, especially when compared with hand brake stops under ordinary conditions, when the men are not all at their posts, and in a dark night with the roofs of the cars slippery with ice, cannot always apply the brakes as quickly as in these trials, where the hand brake had every advantage. The foundation brake rigging throughout was excellent, and the strength of the brake beams and levers added materially to the success of their tests, and told especially in favor of the hand brake. The amount of slack to be taken up being small, the brakes could be quickly applied.

The train is that used at the Burlington brake trials last summer, and the cars are of the Pennsylvania pattern, and of 60,000 lbs. capacity.

But after all, figures convey to most minds but a feeble impression of the facts. To know just what they mean the stops must be seen. We read that a 50-car train, running at 40 miles an hour, is stopped without shock in 600 feet; but it is only when we stand by and see a train 1,900 feet long, coming down grade with the tremendous momentum due to a speed of nearly 60 feet a second, brought to a smooth stop in less than one-third of its length, without shock, that we really understand the magnificent achievement. Therefore, we urge every railroad man to see for himself if he possibly can, at least one of these trials. In no other way can he appreciate what is actually done.

Undoubtedly the tour is a great advertisement for the Westinghouse apparatus, and is designed as such; but it is none the less instructive for that. It is not a hippodrome or a circus. The brake is shown in working condition. The triple valve as used on this train is more strongly constructed than the earlier forms, and will probably prove fully as durable and efficient. The pressures and leverages are designedly kept low enough to avoid sliding the wheels under empty cars. At the Buffalo trials, in the second 50-car stop, at 40 miles, the rails were wet and some of the wheels were seen to slide a few feet, perhaps 10 ft. at the most. It is said that no sliding has been seen in any other stops of the series, excepting in those of the 20-car trains. In these latter stops higher leverage and pressure are used, and there is no effort to avoid skidding. One defect in the series of trials which will make them somewhat less conclusive than they ought to be is that all the cars are empty. But, as we have said before, it is highly probable that the brake which stops 50 empty cars with practically no shock, will stop a mixed train with a shock not injurious, at least; and, indeed, we believe that it will be found to be not even disagreeable. However, Mr. Westinghouse is already prepared to automatically adjust the brake power to the load in the car, and three of the cars in this experimental train are fitted with a device for that purpose. It is very simple, and apparently efficient.

But the stated trials are by no means all that is of interest in this tour. The journeys of the train from place to place are noteworthy. The train is made up of 50, 33-ft. freight cars, a Pullman hotel car and two locomotives. To safely haul this train in unbroken runs of hundreds of miles, on fair passenger train time, is in itself a remarkable achievement. The run from Cleveland to Buffalo, 183 miles, was made at an average speed of 30 miles, and 50 miles an hour has been frequently made for considerable distances. We have already mentioned the stops made by the train when flagged on a down grade going 52 miles an hour. Another good stop was made when a draw-head dropped down and gave an unexpected breakaway test. The emergencies coming up in the journey of thousands of miles will go a good way to clinch the conviction that these are not altogether "fancy" tests.

The whole performance has also an important bearing on the coupler question. Between St. Paul, St. Louis and Boston the train has been hauled through a good many sags, and over a good many hog-backs, and so far as we have heard, every man who has had anything to do with it believes in "spring slack" today. The most trying part of the journey, however, must have been that over the Boston & Albany, and of that we have not yet received any reports.

Recent Inter-state Commerce Decisions.

The case of *Allen vs. Louisville, New Albany & Chicago*, briefly summarized in our issue of last week, is not in itself particularly remarkable, but Judge Cooley, in his opinion, gives utterance to some principles which may have great importance in future questions under the long and short haul clause. The railroad transports wheat from Indianapolis to New York via Michigan City and the Michigan Central at a total charge of 23 cents a hundred, while the rate from Frankfort via South Wanatah and the New York, Chicago & St. Louis is 25 cents a hundred; Frankfort and South Wanatah being points intermediate between Indianapolis and Michigan City. Since the transportation from Frankfort to New York is over a different line from the other it is hard to see why any one could suppose that the case came under the operation of the long and short haul clause. It would seem, at this distance, as though the natural mode of procedure for the plaintiff would have been to demand that their grain should be carried via Michigan City at the 23 cent rate, and thus indirectly compel the South Wanatah route to reduce its rates to the same figure. The attempt to do this might give rise to some very interesting questions of law.

In its present form the complaint could have been dismissed without any long discussion of principles; but Judge Cooley obviously deems it important to explain the law on the subject, and to point out to the complainants and the public a number of cases to which the principles of *Vermont State Grange vs. Boston & Lowell* does not apply. A railroad, he says, is not responsible for the through rate as much as if the whole was for a transportation over its own line.

While the defendant names the through rate to shippers when it is called for, the rate from the intersecting point is not controlled by defendant, but is fixed by the crossing roads. The Michigan Central Railroad, it appears, will accept Indianapolis grain

from defendant at Michigan City and pro rate the twenty-three cent charge, on a mileage basis, and the New York, Chicago & St. Louis Railroad will accept Frankfort grain from defendant at South Wanatah and pro rate a twenty-five cent charge on a mileage basis. If defendant consents to receive the proportions from the two roads, respectively, it can name a through rate to shippers when they ask for it, but in doing so it does not make the through rate any more than it would if it named its own proportion and that of the other roads in figures separately.

The short haul rates of the Boston & Lowell road in the Vermont Grange case were illegal, because the road, by participating in certain long haul rates, voluntarily fixed a limit for its own action in other cases, not because those long haul rates were things for which it was wholly responsible. "But in that case there was no question of responsibility for the rates which were found to be illegal, nor could there have been, for they were made at pleasure by the local road. In this case [*Allen vs. L., N. A. & C.*] the rates which the defendant makes exclusively are not complained of, and as no one can be convicted of illegality in respect to action of others which he could not control, it obviously becomes necessary before defendant can be charged in this proceeding to show that at least it had the power to make the through rates different. But all the showing is to the contrary."

But while the responsibility of the railroads under the fourth section (long and short haul clause) is thus limited, the Commission has rendered an opinion which will extend their jurisdiction under the second and third sections. In the case of *The Board of Trade Union of Farmington et al. vs. Chicago, Milwaukee & St. Paul R. R. Co.* it is held that rates charged upon one branch of a railroad may become the standard with which the charges on other branches must be equalized. The railroad company gave a milling-in-transit rate from Minneapolis to Chicago, over the river division, of seven and a half cents a hundred. This was forced upon them by the competition of the Duluth route, and is a *pro rata* proportion of the Dakota through rate. On the Iowa & Minnesota Division, however, a Minneapolis-Chicago rate of fifteen cents a hundred was fixed and maintained, and the rates from intermediate points to Chicago were not reduced much below this figure. The Commission declares this to be illegal. The questions involved are so important that we quote its words in full:

"While the inhibition of the fourth section of the statute against charging more for a shorter than for a longer distance over the same line does not literally apply, the defendant is, under the circumstances, required to make its rates reasonable on both branches of its road. If the two lines were separately owned and operated, competition might substantially equalize the rates. And the fact that one company controls parallel lines affords no warrant for giving superior advantages to the patrons of one line, and denying similar advantages to those of the other line. It may not be essential that the rates on the two lines should be identical. Some difference on account of greater distance and increased operating expenses, and the conditions affecting the traffic, may be reasonably permissible. Nor is it enough that independently considered as if the parallel line did not exist, the higher rates might be deemed reasonable. They should be relatively reasonable, in view of their relations to each other and their effect upon the public, in order to prevent undue and unreasonable prejudice and disadvantage, and thus in their results become unjust and unreasonable."

In other words, rates on one branch cannot be reduced without rendering the railroad liable to similar reductions on other branches. Not that they must necessarily be carried to the same extent; in this instance the Commission contents itself with prescribing a rate of ten cents on one branch against seven and a half cents on the other. But the principle is none the less fundamental and wide-reaching. It is not too much to say that in its indirect bearings this is the most important decision yet rendered by the Commission.

What may be the results of this position we are not yet prepared to say. We have no doubt that the action of the Commission in this particular case was just and fair. Nor do we doubt that the letter of the Interstate Commerce act furnishes a warrant for its interference. But where is such action to stop? Why shall we prescribe a ten-cent rate rather than a nine cent or eleven-cent rate? How wide must the loop be in order not to be affected by the action of the main line? This decision opens an almost infinite number of questions. It is hardly an exaggeration to say that it lays a quarter of the railroad rates in the United States open to litigation, and to litigation of a peculiarly difficult kind, because each case would have to be decided by itself.

In the previous opinions of the Commission it has made an effort to diminish the uncertainty to which the rights and duties of railroads were subject

under the law. Each case, as it was decided, has settled a number of others. This decision has precisely the contrary effect. It has opened a great many more points than it has settled. This may have been necessary, but it certainly was unfortunate. Strong as the Commission to-day is, it cannot lightly afford to open to litigation a class of questions too numerous to be readily examined in detail and too complicated to be settled on any general principles.

Showing Interest in Employees.

General Manager E. T. Jeffrey, of the Illinois Central, in his address to the Locomotive Brotherhood, at Chicago, recently, said: "I speak whereof I know when I affirm that the managing officers of great railway corporations spare no effort consistent with good discipline to create and foster a family feeling, a feeling of close relationship, between the corporation and the men." It will be remembered that Charles Francis Adams encouraged the engineers by similar utterances at Boston, and these two are only samples of many expressions in the same line, both public and private; though, unfortunately, the latter kind greatly outnumber the former. It is thus plain that there still exists the disposition to secure to railroad employees as pleasant and prosperous conditions as they ever enjoyed, whatever may be the real outcome of this feeling among managers; and this is a point to be remembered and to feel thankful for.

But Mr. Adams voiced the generally acknowledged fact that the actual state of things now is quite different from that of 25 years ago. Then the general superintendent personally knew a large proportion of his station agents, conductors, engineers and other employees who came in direct contact with the work and with the public; and not only was able by means of this intimacy to exercise a certain influence on these subordinates, but was enabled himself to get and keep a "grip" on some departments of his own work which now is rarely held. It may be remarked in passing that some of the best specimens of discipline at the present day are on roads which are not very large and where the head of the operating department still has an intimate acquaintance with the details of operation and with the men who conduct them. But the consolidation of roads into large systems has made it utterly impossible for the actual head to deal directly with the workers, because there are too many of them; and the question is, whether the advantages of the old system must be wholly sacrificed to the necessity that has forced railroads to consolidate or be crushed out. The changed condition of things is not so much because officers now are more selfish and hardhearted than formerly, but because they do not know how to give effective expression to their good wishes and intentions. Is there any way that they can learn how?

A general superintendent who finds his work too heavy engages an assistant; as the road and business grow he enlarges his force until, like the general superintendent of the Pennsylvania Railroad division of the Pennsylvania Railroad (which latter is in turn only a division of the Pennsylvania system), he has, say, ten division superintendents. He cannot deal directly with his train, station and trackmen unless he knows how to crowd ten days' work into 24 hours. Then comes the question of the quality of the work which is done by these ten assistants. Certain portions of the chief's work must still be done by himself, and so he delegates to the lieutenants the affairs which it is least necessary for him to personally know about; the least difficult questions naturally fall to the new men, and, these requiring less ability for their consideration, it has come about that the average division superintendent is not so intelligent, broad-minded, courageous or mentally well qualified in general as is the average general superintendent. This may be set down as one of the reasons why employees do not know the directors' feelings and disposition better than they do; the impressions made on their minds not only come through an additional medium, but through a less desirable one. The general superintendent has been gradually lifted to a point where he has lost a little of his sympathy with the lower grades, while the division officer has not got high enough to interpret the wishes of the general management in the most perfect manner; and so communication between the highest and lowest grades is impeded.

But suppose every division superintendent were a copy of his chief so far as concerns general judgment and disposition to treat his men fairly; is the difficulty cured? No, for the reason that ten men cannot be made to think in the same channel. There must be a single head, in the nature of things; a house divided against itself cannot stand; and so the problem of

managing several thousand men at arm's length must be accepted and handled as best it can be. Somebody has said that he would travel 30 miles in the rain (presumably on foot) to have an interview with a man rather than write to him; this is an exaggerated view, but every one appreciates the principle. To talk face to face with an individual is so much better than a written communication as a means of bringing two minds to fully understand each other, that practically nobody attempts to substitute one for the other where interests involved are at all complicated, unless indeed he be forced to. Bacon says: "To deal in Person is good when a Man's Face breedeth Regard, as Commonly with Inferiours; or in Tender Cases where a Man's Eye upon the Countenance of him with whom he speaketh may give him a Direction how farre to go."

Railroad general officers have made up their minds that they must communicate with their men through general printed instructions; and have apparently in many cases given up all hope of controlling them in the efficient manner that characterized the old times. Then a superintendent could pick his men, and in many if not all cases could warrant a certain degree of fidelity and success, because he had personally tested their qualifications. Now, if a disaster results from inefficiency in the personnel, the only defense is, "We secured the best men available." Such a thing as hunting for a qualified person, or painstaking work to qualify "the best available" after getting him, being apparently deemed out of the question. And yet this is just what was done under the old régime; the superintendent's acquaintance was not only wider but it was more real and intimate, so that he really picked from a wider range; and he picked for himself instead of deputing a yardmaster or some other less competent officer. And the men—freight conductors, for instance—having frequent interviews with the superintendent, learned many things in an easy manner which they now fail to learn even after a severe trial.

But times are changed and we cannot go back if we would. We must meet the conditions as best we can. If everything must be done through the medium of documents and letters we can at least try to have skillful makers of documents and trained lieutenants to interpret them. The bearer of a message is in a sense as important as the sender of it. Much can be done by having a high grade of division officers, men of broad minds and sound judgment, who in dealing with subordinates where the requirement is simply the knowledge gained by long experience and the faculty known as a judicial mind, could take final action in the name of the general superintendent or manager. The reason a general officer gets along more smoothly with men than his subordinate does is because he does not feel trammelled; he has elbow room and knows it. The mere consciousness is of value whether he uses his liberty or not.

To have the best division officers they should be men raised from boyhood on the division, as intimate acquaintance is an important factor and one which cannot be acquired by hot-house growth. To obviate the tendency to narrowness and provincialism which is sure to appear in one who has always staid at home, take the boy of 15 or 18 and put him through a few years' practice on other divisions or other roads (and in the railroad college, when it comes), with the express understanding that he is to go back to his home-division when the proper time comes. A lesson should be learned from our American system of general and local governments. States exercise local self-government and still work in harmony with the general government. If a state lacked trained men to fill offices it would be more likely to send away its sons to be educated than to import ready-made statesmen from other localities.

Some of the influence that officers on small roads exercise among their men is by showing appreciation of unusual merit (without waiting for it to be very unusual). They have even gone so far as to make presents of Thanksgiving turkeys, or even money; and one great reason why such acts were not decried as improper was because they were substantially just, the intimate knowledge of the management enabling it to give credit where credit was due. Favors have been given without any established rule; on a large road it is impossible to do this justly; why not try to give them with a rule? Promotions have taken the form of favors, but the intimate acquaintance of the superintendent enabled him to base these favors on justice, and so complaint was silenced. Cannot this acquaintance be cultivated (on a large road) by machine methods? It is worth a trial. To say that a superintendent makes promotions justly, implies that

he knows of undesirable qualities in some men who have perhaps never been suspended or even censured; should not acquaintance with men's weak points and their tendencies to disobedience be cultivated in some more systematic manner than simply by investigating accidents and by punishing for faults which occasional individuals have by chance been caught in?

There are isolated cases illustrating some of the ideas here set forth, but there should be many more of them. One road inflicts a fine for disobedience of the smallest rule, even if no harm ensues. Another keeps men's records from the time they entered the service and allows them to suggest in their own language the tenor of what is written down in that record. One road has found great benefit in paying premiums to freight conductors. Several give important support to mutual benefit associations and vie with each other in expressing true interest in their men. Why not give more favors to men while they are well, without waiting for them to fall sick? One small road hopes to give its men a stock dividend some day. On another, the section masters have a free excursion over the line after the directors have inspected it. All these are hopeful indications in the right direction; but, like the diminutive steak brought by the waiter to P. T. Barnum, they must be regarded as samples. "Yes, that's what we want; bring on some."

Discrimination in Car Supply.

The complicated question of how many and what kinds of cars a railroad must furnish for its general business is to come before the Inter-state Commerce Commission in the shape of a petition filed by Riddle, Dean & Co., charging the Pittsburgh & Lake Erie with discrimination in the furnishing of coal cars to certain mines. The commission with its 15 clerks is badly behind its docket and growing worse all the time, so that this case may not be reached for an indefinite period; but the railroad has sent in its response and has also given it to the newspapers.

Messrs. Riddle, Dean & Co. charge, in substance, that they receive less than their share of cars; that the road has favored coke shippers by putting high side-boards on coal cars; that box cars are allowed to be used for coke but not for coal, and that consignees are not made to unload with reasonable promptness.

The road in its defense says that traffic has increased so suddenly this year that its equipment was inadequate, and that its neighbors, being in the same predicament, cars could not be hired. It goes on to state the number of each kind of cars owned, and to aver that its aim has been to be perfectly fair, and in case of scarcity of cars to explain matters politely to complainant and to all shippers. Other shippers have acknowledged the reasonableness of the road's conduct. Complainants speak of "our mines," but the road thinks they are only brokers and own no mines. The officers of the road aver that box cars are unfit for coal but are fit for coke. A few coke cars were used temporarily for coal during the strike in the coke region; after the strike was over the side boards were replaced, thus giving rise to the complaint on that point. As to the delay in unloading cars the company says in substance, "give us an easier one;" its experience with consignees is the same as that of every one else.

Here, now, is opportunity for the Commission to touch upon all sorts of questions involved in the general management of a railroad. If there has been any lack of spice and variety in its deliberations this will relieve the tedium, partially at least. If it can tell railroad men how to prepare for a rush of business before the rush can be predicted and before they have earned the money with which they can make the preparations the commission certainly ought to please the most zealous anti-monopolist. Or, if occasional shortages are inevitable, a method of furnishing a dozen cars each to a dozen shippers, when there are only 100 cars to do it with, would be a boon to many a harassed superintendent. How to fill orders equitably under such circumstances has engaged the anxious study of hundreds of car distributors. If the complainants' attorneys can, by adding their wisdom to that of the Commission and of the railroad men, solve the problem they will have done a valuable service. When one has done his best at fairness, a way of making capricious shippers believe that fact would command a premium if discovered. And finally, if a practicable plan for getting bulk cars unloaded by consignees can be evolved, the man or men originating it will certainly be canonized.

The only points that the petitioners can make much of would seem to be the specific charges of discrimination, and the matter of using box cars for coal. If they can show that Smith & Jones received 50 per cent. more than the usual allotment while they (com-

plainants) received much less than the ordinary number, a considerable burden of proof would fall upon the railroad company. Some roads do use box cars for coal; the Pittsburgh & Lake Erie claims not to do so with its own cars, but quite likely has no objection to using other people's. How much it hurts cars is a debatable point. A road which withholds its box cars from coal traffic this year (and uses the fact in argument before the Commission) must at least be quite circumspect lest some future exigency lead it into inconsistency. The question whether \$100,000 in the treasury should be spent for coal, or coke, or house, or stock, or passenger cars; or, indeed, be used to pay some old debt, or to increase some poor laborers' wages, or to rebuild a bridge, or to establish a passenger agency in Australia, or to buy electric lights, or to pay deceptive dividends so as to "support" the stock, is indeed a question which nothing less than a commission of five astute lawyers could be expected to satisfactorily settle.

The Boston & Providence.

The lease of the Boston & Providence to the Old Colony is now generally acknowledged, though it has yet to be approved by the stockholders of both roads, who have not thus far been notified of any meeting. The price reported seems high. Ten per cent. on the \$4,000,000 of Boston & Providence stock, with 4 per cent. on the \$1,000,000 bonus, which it is said will be given, and which will presumably be in Old Colony bonds, makes a total fixed charge of \$440,000, which is 12½ per cent. above the average net earnings of the road for eight years past (\$390,770). But the net earnings have been kept down by charging all improvements to expenses, and thus the road is doubtless in a position to do a large business without great expenditures in the future. Five million dollars represents \$70,851 per mile of road operated. The Boston & Providence own \$158,340 of stock in the Providence, Warren & Bristol. The accounts do not say whether this goes with the lease nor what is to be done with the \$500,000 bonds and \$260,000 outstanding notes. Possibly the bonus is to provide for these items. The Boston & Providence is understood to control the Providence, Warren & Bristol, though the reports do not show whether it is common or preferred stock of the latter that is held; the amount stated is not a majority of the whole stock.

The Boston & Providence is chiefly a passenger road, and has a very large suburban traffic, as is shown by the low average passenger rate, 1.87 cents per mile. The freight is substantially all local, as distinguished from competitive trunk line traffic, the average receipt per ton per mile being 2.84 cents.

The ultimate objects of the lease aside from its obvious advantage as securing the control of a valuable local road are not yet very clear. The Old Colony will be better situated to deal with the Stonington and Providence steamers concerning New York business, and possibly may make friends with the New York, Providence & Boston, which forms the middle link in the Shore Line passenger route between New York and Boston, and also controls the Stonington steamboat line. But the latter road is owned largely in New York and there is nothing on the surface to indicate that it will now look upon suitors for its hand with any more favor than heretofore. The rumors that the New York, New Haven & Hartford will try to get the New York, Providence & Boston and then make an alliance with the Old Colony, so as to have a strong line to Boston independent of the Boston & Albany, doubtless have no firmer foundation than the fact that President Clark is a "hustler," and that therefore newspaper correspondents are warranted in predicting that he will do something if he gets a chance. The Old Colony has been reported within a few years to have contemplated a line from South Framingham to Boston to take the traffic of its Fitchburg line which now goes over the Boston & Albany, between South Framingham and Boston. Such a line via Mansfield and the Boston & Providence would be 46 miles long, twice as long as that over the Albany; and even if a cut-off were built the line would still be somewhat roundabout, especially in view of the fact that passengers cannot be diverted from an old route so easily as freight can.

The talk in 1879 about a consolidation of the Boston & Providence and the Boston & Albany was largely or wholly based on the question of station facilities in Boston. The Boston & Albany could avoid a bad grade crossing and a half mile or more of crooked track by running its passenger trains to the Boston & Providence station, and could doubtless use its present station grounds wholly for freight with advantage. It objected in 1879 to using the Providence station unless it could own it; but a 99-year lease might be tolerable, as a period much less than that

will very likely justify a grand union station on the Back Bay considerably further from the centre of the city than any of the present stations. The station of the Providence road is a fine one, and the yard is convenient, but it would be very soon outgrown if used by both roads; in fact, is probably too small now for that purpose. There is talk of a connection between the Boston & Providence at Readville and the Old Colony at Mattapan, but it doubtless originated in some reporter's imagination; nothing is said about the cost of such a line. None of these roads have any terminal room to spare, and would doubtless look with favor on any scheme that should promise more economical use of the room they have. There would be no insurmountable difficulties in bringing the Old Colony trains to the Boston & Albany track and thence to the Providence station or the Back Bay.

These speculations would be quite idle but for the fact that the pervading tendency among railroads to consolidation into large systems is certainly making progress in New England as well as elsewhere. The conservative spirit of that locality has withstood the strong influences in this direction a good while, but the extension of the Fitchburg a good distance west of the Hudson and the presence of the Boston & Maine at two points on the Connecticut River; the New York, New Haven & Hartford controlling nearly all its neighbors and running trains nearly to Vermont, with the other well known combinations, plainly indicate that New England men are not by any means all asleep. The Central Vermont's hold on the New London Northern is probably not very strong, and the New York & New England's faith in its money bags is not the best that could be desired, hence these two have done little or nothing. The Boston & Albany is the only large and strong company that has started no schemes for enlargement. There are faint rumors that the control of the Connecticut River road will be transferred to some one of the larger companies that connect with it; but the basis of the rumors is undiscoverable.

The general freight agents of the Minneapolis-Chicago roads have made an earnest effort to bring about an advance of the present low through rate of 7½ cents per 100 lbs. on grain to 10 cents. The difficulties in the way of an advance seem unsurmountable, however, and in spite of frequent meetings, nothing of importance has been accomplished. The rock on which the roads split is the milling-in-transit rates used by the roads which have Dakota extensions. The non-transit roads, viz., the Chicago, Burlington & Northern, the Wisconsin Central and the Minnesota & Northwestern, refuse to advance the "flat" rate from Minneapolis to Chicago unless the transit and flat rates from Dakota points to Chicago are also raised, so that the Minneapolis rate may be protected. The transit roads refuse to do this. Another obstacle is the Duluth competition. Although lake navigation will soon be closed, the elevators at Duluth are nearly empty and will carry all the wheat they can get until spring; Duluth competition is consequently as strong as ever. On Saturday the roads agreed to raise the rate from 7½ to 12½ cents, but to this the Burlington and the Minnesota & Northwestern have not agreed. It is said that the Wisconsin Central will advance rates on domestic shipments but continue to carry export freight to Chicago at 7½ cents. The Chicago, Milwaukee & St. Paul is understood to have withdrawn the privilege of milling-in-transit at the 7½ cent. rate from some of the local points in Wisconsin in order to induce the Wisconsin Central to advance rates.

The receipts of wheat at four ports from Aug. 1 to Oct. 29 have been as follows, in thousands of bushels:

	Total.	Highest.	Lowest.	Average, Oct. 29.	Week ending
St. Louis.....	1,445	1,066	151	422	297
Duluth.....	5,478	931	31	390	931
Chicago.....	4,136	497	223	318	442
Milwaukee.....	2,588	373	71	199	373

It will be seen that the receipts of Duluth in the last week of October were not only far above the average, but also were the largest of the season; and the same is true only in less degree of the Milwaukee receipts. Naturally the Duluth receipts should be at their maximum, as the time for the close of lake navigation approaches, but a new element comes in this fall in the opening of the Duluth, South Shore & Atlantic, with its two possible eastward connections. The effect of this new line on the Duluth receipts will be watched with interest. But whatever the effect may be in keeping up the receipts, they will fall much below those of last year, when in the four weeks ending Oct. 2 they were 5,447,400 bushels, and in the nine months about 13,400,000. Minneapolis continues to receive over a million and a half bushels per week.

Our readers know that the Fitchburg last summer took control of the Troy & Boston and the Boston, Hoosac Tunnel & Western, both single track roads. The consolidation, last February, of the Troy & Greenfield and Hoosac Tunnel with the Fitchburg gave a line to the Vermont state line, and the subsequent arrangement gave the Fitchburg connections to Troy, to Saratoga and to Rotterdam Junction, thus making a through line under one management from the New York Cen-

tral and the West Shore and the Delaware & Hudson to Boston. At Johnsonville is the junction where the business coming from the various western connections concentrates, and arrangements have been made to use the lines last acquired as double track from the Vermont state line to Johnsonville. The road is now worked as double track to Hoosick, and after Nov. 13 will be so worked to Johnsonville. Stations have been consolidated at Pownal, North Pownal, Hoosick, Hoosick Falls, Eagle Bridge and Johnsonville. Three miles of double track on the Boston, Hoosac Tunnel & Western, between the state line and Pownal, is made use of, cutting out two old Howe truss bridges on the Troy & Boston. At North Pownal a second track of 1½ miles has been built on the Boston, Hoosac Tunnel & Western to avoid a portion of the line of the Troy & Boston, which has always been flooded after heavy rains, and saving the use of two bridges. Various bridges have been strengthened, and other Howe trusses are now being replaced by iron. The whole is a neat illustration of the economies and the other common benefits of consolidation.

The Duluth, South Shore & Atlantic is to be completed in December, but will not be opened for traffic until "after the first of the year," and it is not yet ascertainable just how soon after. It is said, however, on excellent authority, that no traffic contract has been made with any other roads. This is stated in denial of rumors of an offensive and defensive alliance with the Northern Pacific and the Vanderbilt lines. The Sault Ste. Marie bridge will probably be completed within ten days, and the Canadian Pacific's line by Nov. 10. The Minneapolis, Sault Ste. Marie & Atlantic is to be completed, it is now promised, by Dec. 1. The portion still to build is a short section between Gladstone, Mich., and Trout Lake.

The table given below shows the shipments of Lake Superior ore by ports to date this season, and for the corresponding period in 1886:

Name of port.	1887.	1886.
Marquette.....	740,947	579,733
Escanaba.....	1,846,537	1,340,020
St. Ignace.....	86,030	68,081
Ashland, Wis.....	988,036	653,294
Two Harbors, Minn.....	357,774	479,941
	4,020,224	3,121,069

By ranges, the shipments have been as follows: Marquette range, 1,622,321 tons; Menominee range, 1,018,198 tons; Gogebic range, 1,021,391 tons; Vermilion range, 357,774 tons.—*Marquette Mining Journal*, Oct. 21.

This shows increased shipments of about 27 per cent., and on the strength of this increase of traffic the lake vessel owners have imposed such charges that their profits, according to the *Iron Trade Review*, have amounted to 30 per cent. Of course this is too much for peaceful possession, and as we have noted, all the lake ship building yards are full of business, and a pleasant part of this news is that many of the new vessels are of steel and iron, fitted with triple expansion engines, and in model not all of the old style of "grain tank" so long used on the lakes. The question of interest now is the probable rates for next year. If the development of the mines and the demands of the country call for another increase of 27 per cent. in the shipments all the vessels in the trade will probably again return to their owners on the average one-third of their first cost, but it is not likely that the same high prices will be paid for Lake Superior ores in 1888 as this year, even if there is no increase in production, as there is small doubt that there will be a decreased demand for steel and iron next year, and with it a fall in price, which, considering the increased tonnage afloat on the lakes, must be shared between the ore producer and carrier.

In the annual report of the Old Colony road for the last fiscal year it is said that the Johnson heater, which has heretofore been used, has been found very satisfactory. The heat furnished by the hot water circulation is equable and controllable. The larger part of the cars have been furnished with this heater and circulation pipes, at a cost of about \$250 per car. No passenger has been injured by the use of fire in the cars since the road was opened in 1846. Nevertheless in deference to the popular demand for heating from the locomotive, contracts have been made to equip several trains with the Sewall and other systems. Unusual difficulties are thought to exist in the way of the use of such systems as the train are made up and distributed in their transit, but the experiments will be fairly tried and that system adopted which proves to be the best.

The Pennsylvania road has, in connection with the recent changes in the regulations of the Relief department, passed a vote which, while not important financially, considering its effects as a whole, may be the means of much comfort and peace of mind to worthy employes who are exceptionally unfortunate. It provides, virtually, that when a member of the relief department is disabled by sickness or accident for an unusually long time, and beyond the limit within which he is entitled to receive benefits from the fund, the railroad company will give him a gratuity. There are conditions, of course; all that the directors actually promise is to investigate and take action; but if the plan is carried out in a reasonably charitable spirit, as it undoubtedly will be, a decided impression for good cannot but be made on the employes.

The amended regulations extend the time which new members may take to make up their minds as to how much insurance to take, and the time during which insurance is continued valid in case of nonpayment of dues; they also abolish some of the restrictions heretofore existing in other cases; the whole showing that the directors of the railroad company take a real and lively interest in their employes' welfare.

There has been, however, no action looking to retiring pensions, as was reported.

Mr. Fink gave little attention to railroad affairs during his recent visit to Germany. In a recent conversation he said he doubts if much progress in railroad building had been made in Germany since 1881. He has long believed the American system of associated control to be better than centralized control under state ownership, as the former keeps up such competition between the roads as secures for the public better accommodation and lower charges. The Inter-state law was a step toward the desired unity in the management of American railroads, but one not involving the assumption of the property by the government. Without the aid of the voluntary association of railroads it would have failed, as was predicted by one of the principal railroad journals of Germany. Mr. Fink, although not sanguine as regards immediate results, looks forward to a time when the railroad Associations, under the auspices of the Inter-state Commission, will secure for this country that unity which in Germany has been obtained by government ownership.

Estimates of the value of a new line of transportation, definitely measured in a reduction of the expense of general business due to it, are not easily made; but the following figures for the Suez Canal were calculated by an English banker of Bombay, and have the indorsement of the Statistical Society's approval. He says the merchant or agent needs because of the facilities of the canal a much smaller profit or commission, because he can do a larger business, and, by aid of the telegraph, with greater certainty. For these items he makes a reduction of from $2\frac{1}{2}$ to 5 per cent. Then there is a gain of 3 to 4 months in time, equal to a reduction of $1\frac{1}{2}$ per cent.; and the gain by lower insurance rates, equal 1 per cent. Perhaps the most important change due to the canal has been the fostering of the direct trade of the east with the Continental, and especially the Mediterranean ports.

The speed attained by the bicycles and tricycles on a good road is superior to that attained by a fast trotter for the same distance, and as a speedy mode of conveyance is only surpassed by a few of the fastest steamships and the locomotive. Two riders recently rode a tricycle 20 miles 715 yards in one hour, and rode 25 miles in 73 minutes 42.8 seconds, or at an average rate of 20.35 miles per hour. The mechanical construction of a bicycle is well worth study. The requisite amount of strength is probably obtained with a smaller proportion of weight than in any other machine, and considering the trying nature of the strains, a fair amount of durability and immunity from breakdowns is obtained. The price, however, per pound (about \$3) of the best and lightest machines is considerably in excess of that of almost any other machinery.

General Superintendent Olhausen makes the following statement of facts in reference to the reported increase of wages of freight brakemen on the Central of New Jersey: Brakemen have been receiving from \$2.50 to \$2.85 per round trip, without allowance for overtime, and will now get \$2.75 and overtime beyond 13 hours at 27½ cents per hour. It is an averaging rather than increase of pay, and it is not true that hereafter each train will have three brakemen instead of two. Additional brakemen have been put on a few trains. The change was due to solicitation of the Grievance Committee of the Conductors' Brotherhood, and is worthy of note because of that fact. If overtime does not begin so early as to tempt to its manufacture by delays it ought to be paid for, and every grievance settled in an amicable manner is a public gain.

The report of 1886 for the German system of compulsory insurance of workmen shows that 3,100,000 were insured, representing the labor of 233,000 manufacturing establishments; and the indemnity was paid on 10,414 accidents. Of these, 2,394 caused disability of three to six months, 3,636 caused lasting, but partial disability, and 1,701 complete and permanent disability. It is both alleged and denied that the insurance was more costly than in private companies. Employers are required to give notice whenever a new hand is employed, and to advance insurance premiums for him, one-third of which is to be contributed by the employer. Railroads are included under the law, but not all government employees.

In the announcement of the next meeting of the Western Railway Club the Executive Committee calls attention to the fact that very brief papers on matters of personal experience might often bring out valuable discussions, and urges members of the club and others to come forward with such papers. Many stimulating ideas and much valuable knowledge are lost to the world by the fact that their possessors never find time to present them elaborately. No one knows this better than the editor of a technical paper, and we wish the Western Club all success in its efforts to bring to light the elusive and precious nuggets of wisdom which its members conceal.

The experiments with petroleum fuel on the Manhattan (Elevated) locomotives showed that the heat could be easily regulated and a supply of steam obtained without any smoke or objectionable odor. The cost, however, was prohibitive, being nearly double that of anthracite for the same amount of useful work.

The recommendations of the Trunk Line Executive Committee as to a tariff of export rates have been ratified, and a ten days' notice of changes made obligatory. The date for the rates to go into effect is Nov. 14. Chicago dispatches,

say, however, that the Chicago and Grand Trunk insists on making the rate to European ports via Montreal four, or at least three, cents lower than via American ports. Beyond this there has been nothing brought out to call for further comment than that which we made two weeks ago.

The combined per diem and mileage basis for settlement of car service accounts has been adopted by the Central of New Jersey and the Lehigh Valley.

Record of New Railroad Construction.

Information of the laying of track on new railroad lines in 1887, not before reported, is given as follows:

Central Massachusetts, from Ware to Northampton, Mass., since last reported, 22 miles.

Florida Midland, from Ocoee to Waco, Fla., 7 miles.

Idaho Central, from Nampa to Boise City, Idaho, 20 miles.

NEW PUBLICATIONS.

Forestry in Europe. Reports from United States Consuls. Government Printing Office. 1887. 8vo. pamphlet, 320 pages, plates and index.

Report on the Relation of Railroads to Forest Supplies and Forestry, with Appendices on the structure of some timber ties, their behavior, and the causes of their decay in the road-bed; on wood preservation; on metal ties and the use of spark arresters. Compiled by the Chief of the Forestry Division, Department of Agriculture, Bulletin No. 1. Government Printing Office. 1887. 8vo pamphlet, 149 pages, plates and index.

The very rapid destruction of our forests by the axe and by fires is a fact too well known to require reference to the figures which are given at great length in the last census reports and report from the Department of Agriculture. The question of the future supply of timber for railroads and of the conservation of that in use has too often been treated by railroad managers from the standpoint of a certain past President of the Union Pacific. When the late T. E. Sickles, then General Superintendent of the road, proposed a plan for crescenting the ties bought for renewals, the President asked these three simple questions: "You say untreated ties will last 5 or 6 years? Do you advise spending money that will give no return for five years? And you call yourself an engineer?" Too many roads are skinned in this systematic manner with a view only to immediate dividends, and very few have made any thorough attempt to provide a future supply of timber. A noticeable exception is the Kansas City, Fort Scott & Gulf, which commenced tree and hedge planting on a large scale. Most of the other roads that have given any attention to the subject have after a year or two allowed the plantation to shift for itself, as the ultimate advantages were not likely to affect net earnings—immediately.

The slow growth of timber is a natural bar to its cultivation, and the fact that in but few states is any abatement of taxation made on land devoted to timber cultivation may be said to be an artificial bar, more effective than that opposed by nature. When we reflect that pine, oak and beech require on an average about 100 years to reach their full growth, though for ties and telegraph poles about 40 years is sufficient, it will be readily admitted that a man who plants out a forest must have a keen sense of his duty to posterity, however poor the land may be.

In Europe many of the forests are the property of the general government or of municipalities; the government often granting bounties to those communes which undertake to plant with forest poor or waste lands, and those now growing are regarded as "a trust handed down to us from past ages, whose value consists not alone in the income derived from the wood, but also in their influence on climate and rainfall. Its importance is not merely a question of the present day or of the present ownership, but is also a matter which concerns the future welfare of the people. This is a truism beyond contradiction, but nevertheless it is daily disregarded." Hence the laws control state, municipal, corporate and private woodlands, and in many countries the yield from these exceeds the home consumption. In this country, on the contrary, our lands are being denuded of trees, and people are so careless of the results of the rapid destruction of young timber for ties and the consequent heavy expense for their renewal, that a railroad company has seldom, either in its prospectus or annual report, mentioned any intention of preserving its ties. There is, however, a growing sense of the necessity of protecting the woodlands and of planting new ones; and the methods and possible economy of timber preservation are becoming more widely known. There is much reason to think that these are matters which will henceforth get more attention from the railroad companies than they have had in the past. The bulletin of the Department of Agriculture gives in an appendix an essay by P. H. Dudley, on the structure of certain timber ties and the causes of their decay, with notes on the adhesion of spikes. Another appendix is an essay by Col. Henry Flad, on wood preservation, with notes by Howard Constable. In this appendix are mentioned the various methods of wood preservation, and it describes at some length the method pursued in Missouri, under Col. Flad's direction, of treating timber in the woods and without an expensive plant.

Captain Bixby, Corps of Engineers, U. S. A., contributes a short essay on the use of wood-cresote oil as a wood preservative. This is one of the products from the distillation of "fatty pine" wood in closed iron cylinders. Captain Bixby asserts that dollar for dollar it will give results in the preservation of timber from destruction and decay far superior to those got from dead oil; and he also thinks that it does not impair the strength of the timber treated. This is a most

important fact, if it be one, as too heavy a charge of dead oil is generally thought to weaken the timber.

Mr. B. E. Frenow, the Chief of the Forestry Division of the Department, in treating of steel ties, makes the following point: "From a railroad point of view the introduction of metal ties recommends itself as affording additional revenue, if otherwise the cost of first construction and maintenance is satisfactory, for the manufacture of a ton of steel ties creates a traffic over the railroads of two tons of raw materials." This is putting the case rather mildly, as 2 tons of ore, 1.6 tons of coal or 1 ton of coke, and $\frac{1}{4}$ ton of limestone are about the lowest figures for one ton of pig-iron, and a ton of steel ties would require 1.15 tons of pig-iron, or about 4 tons in all. But how much of this would fall to the company buying the ties is another question. However this may be, if steel ties will last 25 or more years, and cost less in maintenance, as Mr. Frenow's researches seem to show, nothing but the reasoning of the former President of the Union Pacific will prevent their use.

This report, which is valuable throughout and should have wide circulation, concludes with communications on smoke consuming devices by J. N. Lauder, of the Old Colony Railroad, and on the importance of spark arresters by G. W. Tilton, Superintendent of Motive Power Chicago & Northwestern. Nor should those interested in the subject fail to read the Consular Reports, for though evidently written by men greatly ignorant of the subject, they contain much information on forest culture as well as many laws which will never be applicable to this country.

Supplies, Pay-Rolls and Employes is the title of a 25-cent pamphlet by B. Norton, Assistant Superintendent and Traffic Manager of the Long Island Railroad, in which there is a large collection of notes from the experience of a purchasing agent and a paymaster. The notes are very poorly arranged, in fact not arranged at all; but the substance of them is of value to men in the departments named, because it is plain that they came from one who knows whereof he speaks. The bulk of the matter refers to the commodities which most engage purchasing agents' thoughts, such as rails, ties, wheels, glass, oil, varnish, lumber and everything else; but some things less talked about are brought in occasionally. We give an extract which shows the style of the work:

When a railroad company takes up the question of time-tables, it has a matter of importance to handle which on most roads is little thought of or considered. If the passenger traffic is heavy, and the number of travelers during the year counts up to millions, the calls for time-tables are plenty. Everybody wants one. After he has satisfied himself as to whether he is in time for his train, or that he can reach his destination Sunday as well as any other day, he will consign the leaflet or folder to the waste basket or tear it up while he ponders over the idea of his journey. This refers directly to the time-table sheets which every company must keep on hand at its stations for the convenience of the public, beyond the cards that are framed as they are issued and hung up conspicuously on the walls of its waiting-rooms. A neat and attractive folder, for general circulation, is very desirable, particularly if a road is paralleled by some other line and the competition is consequently strong. There is more virtue in a neatly gotten up schedule of trains than one would suppose. A traveler in doubt is apt to reason that if the road is kept up in a corresponding condition and the trains are made up on the same plane, he would prefer to go by that route rather than by the one which advertised its trains on a cheaply gotten up leaflet. But after all, it would be extravagant to contract for elaborate title pages and expensive finish and the best quality of paper. Where the consumption runs up into the hundreds of thousands, two or three dollars per thousand saved in a contract for time-tables for general distribution is well directed economy. There can be money enough saved on time-tables in a year to pay for the service of a good many office boys and other necessary features in the general management.

There is every necessity for exactness in the make up of the schedule of trains, both for public distribution and what are known as employes' tables, and a contract should be made with a well conducted and reliable printing house. A close price should be made, and great care taken not to have too many proofs rendered when changes are made, for the printer's charges for alterations in composition can be made very heavy. With time-tables, as with other supplies, the quantity required should be carefully arranged for from time to time, so that when a new schedule goes into effect there will not be crates and boxes of old ones left over for the waste paper bag. The fact that the income of the road is heavy is no justification for heavy expenses which are not really necessary. The railroad man who serves his company best is the one who, by good judgment and care, economizes in the right direction every time. Some men make a great show of economy, and the effect is often startling; but while they are straining at gnats they are swallowing full-sized camels.

Train Telegraphy is the title of a pamphlet issued by the Consolidated Railway Telegraph Co., of 13 Park Row, New York, illustrating and describing their system of telegraphing to and from moving trains, which is well known to the readers of the *Railroad Gazette*. Illustrations giving a clear idea of the apparatus and methods of working are shown, and the system is well described. The cost of a line is given as \$50 per mile (though often the regular telegraph line already built can be utilized), and that of equipping a car \$15. Testimonials from railroad men who have investigated or used the system are appended.

Trade Catalogues.

Catalogue of Drop Forgings Made by Messrs. I. H. Williams & Co., Brooklyn, N. Y. A large number of wrenches, lathe dogs and other work made by drop forging are illustrated in this work.

Catalogue No. 19, Dayton Mfg. Co., Dayton, O. This large and elaborate catalogue contains excellent engravings on a large scale of nearly every possible variety of car furnishings, and a great number of switch and car locks, locomotive headlights, railroad lamps and miscellaneous brass and bronze fittings, many of which are of very artistic de-

sign. The book is a useful work to all concerned in the purchase of car fittings and ornamental brass work.

The Catalogue of the Sheffield Velocipede Car Co., Three Rivers, Mich., is well got up, and contains clear descriptions and illustrations of the various railroad specialties manufactured, including different styles of band car, the Dodge sand pipe, a form of safety steel-tired car-wheel, etc.

The Limits of Plate Thickness in Furnaces.

It is well recognized that when plates exposed to the direct action of fire exceed a certain thickness they are very liable to become damaged by overheating. It has been stated that $\frac{3}{8}$ in. is the limit above which the plates of a locomotive fire-box will not retain their thickness. Much of course depends upon the fierceness of the fire and the quality of the water opposed to it, but it is pretty certain that a greater thickness than $\frac{3}{8}$ in. should stand against even the hot fire in a locomotive fire-box if proper water contact could be insured on the opposite side of the plate, and it is tolerably certain that it is because of foaming in the narrow water spaces that so low a limit as $\frac{3}{8}$ in. is found to hold.

With ordinarily good water in stationary boilers of the Lancashire type it is found that burning of the plate will not occur nearly so soon as above. In the older methods of furnace construction, i. e., with the lap joint in place of the modern Adamson joint, it is a matter of common observation that with plates as much as $\frac{1}{2}$ in. thick no burning occurs at circular seams placed directly in the furnaces. Here then we have a united plate thickness of $\frac{1}{2}$ in., with one intervening joint which may not be a close metallic fit, but we find that the conduction of heat through this heterogeneous joint is sufficiently good to prevent burning of the plate next the fire. Nor are the heads of the rivets either found to suffer, for they have direct and continuous contact from the fire to the water side uninterrupted by any joint between the two plates.

If, however, the thickness of the plates be increased to $\frac{5}{8}$ in. an inch, producing a joint of 1 in. in thickness, then burning is almost certain to take place, the passage of heat through the joint being too slow to prevent excessive heating of the overlap of the plate next the fire, especially when, as is sometimes found, such overlap is longer than is really necessary. With long overlaps the plate edge heats and tends to separate from the other plate, thus at once introducing a space between the two plates and causing further and more aggravated burning of the lap, with the usual accompanying fractures from the rivets to the edge of the plate, and not infrequently fractures extending into the body of the plate itself, causing leakage and necessitating repairs. It is also to be frequently noticed that when rivet heads or the heads of stay bolts in locomotive type boilers are made very large, they rapidly burn down to a much smaller size, the burning away ceasing as soon as the head is so small that the cooling of the plate from the water side is sufficient to prevent the overheating necessary to burning away. Very deep conical rivet heads are frequently found with the higher portions thus reduced. Such observations lead to the belief that for ordinary boilers with fair water contact the limit of plate thickness should not exceed 1 in., and that this thickness in a joint or seam cannot be employed, the seams of all plates above $\frac{3}{8}$ in. thick being of the Adamson or similar form designed so that nowhere is the fire side of the plate more than about $\frac{3}{4}$ in. away from water contact. Even $\frac{3}{8}$ in. plates, lap jointed, will at times burn, but it is rare to find a badly burned $\frac{3}{8}$ in. lap-joint. When lap joints overheat, it is quite easy to trace the line denoting the approximate position of the water side overlap, no burning being traceable at the single thickness of plate. The fact that the plates in locomotive fire-boxes burn so thin as $\frac{3}{8}$ in. is fair proof of the poverty of the water circulating in such boilers, and it certainly does seem that a deep water space, only a few inches in width, and extending to the base ring of the fire-box, is not calculated to afford that amount of active circulation which the enormous generation of steam by the fire-box surface would render advisable. The fact that many engineers have frequently to run for several miles in ignorance of the true water level in the boiler under their charge, still further bears out our argument and points to the necessity of some means being taken to improve the flow of water over the fire-box plates and prevent the foaming, which alone is the true cause of overheating. Plates do not burn away unless thus overheated, and when overheated they must of necessity suffer a great loss of tenacity. The margin of safety supposed to be possessed by a fire-box may be and no doubt very frequently is seriously narrowed by such a condition, and the tendency to drawing of the plates from the stays must be almost more than a tendency only. Further the expansion of the plate alone over and above that of the outer shell plates must be much increased, and a correspondingly increased stress placed upon the stays—a stress of the nature of bending, which induces loosening of the stay in the plates as well as grooving round the stays themselves, or in the plate immediately about the stays. The thousands of broken and leaking stays testify to the severity of their working condition, which could be much ameliorated could some means be adopted of inducing a constant supply of water from the front end to flow into the lowest water spaces about the fire-box. As at present worked these water spaces must be often nearly emptied of anything like solid water, for in the uprush of steam water cannot forcibly penetrate freely by the same passages that afford an outlet upwards to the steam. To ensure the continuous generating of fairly dry steam from a highly heated surface, it is essential that a continuous current of water flow over such surface in much larger quantity than can be evaporated. In such case the circulation is rapid and the bubbles of steam rising with the upward current of water burst when they arrive at the surface level, and a steady steam supply is

thus given; but when circulation is poor steam is produced fitfully, and where the plates become overheated the steam is no doubt frequently more or less superheated at intervals, but the result of a moment's dryness of the water spaces can be none other than a sudden inrush of more water as soon as the further supply of steam is checked by reason of no water being present. The sudden access of water is accompanied by a rapid generation of steam, and as this rises it carries large quantities of water with it, and hence priming arises, the most wasteful fault in a steam boiler. The importance of good circulation cannot be overestimated, and yet no locomotive designer appears ever to give a thought to it. Every effort appears directed to secure the largest amount of nominal heating surface and none to the problem of properly utilizing the surface when there by keeping it as cool as possible. The subject is one that ought to receive far more attention than has hitherto been bestowed upon it.

THE SCRAP HEAP.

Notes.

Two attempts were made on Nov. 3 to derail trains on the Connecticut Valley road, near Middletown, Conn. The first time, a mass of bowlders and steel rails placed transversely across the track was pushed aside by the engine without damage. The second attempt was made by placing several large ties on the track and wedging them in the trestle work of the covered bridge at Middletown. A serious accident was prevented by the appearance of Superintendent Denning, of the almshouse, who summoned aid, and cleared the track.

At one o'clock on the morning of Nov. 3 several masked men stopped the east-bound Salt Lake express on the Denver & Rio Grande road a few miles east of Grand Junction, Col., and compelled the engineer, fireman, mail and express messengers to leave the train, and while they were guarded by one of the robbers, the others passed through the train relieving the passengers of their money and valuables. The robbers then entered the express car but failed to open the safe. The mail pouches were cut and registered packages and letters opened. The train was allowed to proceed after being delayed over an hour, and the robbers took to the mountains.

Clever.

There is a young lad in Kingston, N. Y., says the *Leader*, not more than five years old, who is a wonderful little fellow in a certain particular. He is very fond of studying time-tables and knows many of them by heart. He can tell the time of the departure of trains from that city on the Ulster & Delaware, the Wallkill Valley and the West Shore railroads. The lad can also repeat rapidly and without error every station on the Ulster & Delaware Railroad from Rondout to Hobart. It is something of a marvel the way the youngster has become familiar with these time-tables and railroad stations.

Bulgaria's New Railroad.

M. Vulkovitch, Bulgarian agent at Constantinople, has notified the ports that the Sofia & Pirot Railway will be opened in March, thus completing the line which will connect the Turkish railway lines with the European system.

A Four Per Cent. Advance for Coal Miners.

Messrs. Pardee, Cox and Derringer, the largest individual operators in the Lehigh anthracite region, who have been working their mines since the strike began with non-union hands, have tendered their laborers an advance of 4 per cent. over the wages paid when the strike began, as the advance in coal during October was sufficient to warrant this. The same offer, it is stated, is open to the striking miners with the understanding that when the price of coal goes down that it will be taken off, and that if there are any further advances in the price of coal that the miners shall have the benefit of it. Thus far the miners have not accepted the offer, and it is not believed that they will, as it is 11 per cent. below the demand made by them. The statement telegraphed from the Lehigh region that William Carter would give his miners an advance is said to have been based upon the fact that he would offer them the same advance that had been offered by the other operators, 4 per cent.

Free Circus.

Six cars owned by Robinson's Circus, and containing wild animals, were derailed and then run into by a freight train at the Union Station, St. Louis, one evening last week. One man was killed and others were injured. A Bengal tiger escaped from its cage, bit a man in the crowd, and ran up a flight of stairs. There the circus employes threw canvas over him and held him down till he could be caged again. Nine cages are demolished and two mountain lions are dead. The loss to the company will be \$30,000. Fourteen animals in all got loose. A lion was overpowered with pikes and canvas under a freight train, a leopard was shot in the head, an ibex was captured slightly injured, a big boa-constrictor was cut to pieces under car wheels, and the Bengal tiger has three bullets in him and numberless pike wounds. The escaped animals created great terror in the southern section of the city for over two hours. Squads of circus men with firearms, pikes, etc., assisted officers in capturing them. The last secured was a mountain lion, which fought desperately in a ticket-office until lassoed with strong ropes.

Unsuccessful Blackmail.

John King, President of the New York, Lake Erie & Western, recently received a letter from an individual who signed himself "A Desperate Devil," in which some mysterious style of annihilation was promised to Mr. King and his road if the modest sum of \$50 was not paid cheerfully and quickly. The writer of the letter described himself as a gentleman of rare endowments, who had grown bad under protest, and would reform immediately when the necessary \$50 was forthcoming. Mr. King refused to buy back virtue at even so slight a figure, and he gave the case into the charge of his private secretary, James T. Nicholson, who, with the aid of a detective, caught the blackmail in his own trap. A messenger was sent to the corner of Broadway and Vesey street, New York, the place designated in the "desperate devil's" letter with an envelope supposed to contain the hush money. Another messenger was waiting there to receive it. The detective made this latter boy take him to the man who had written the letter. He was arrested and gave his name as Charles J. Campbell, claiming to know nothing about the affair.

The General Time Convention.

In considering the causes that have led to this happy result [the adoption of the uniform code], the reorganization of the General Time Convention at Cincinnati, in April, 1886, was certainly an important factor. Previous to that date there were two Time Conventions, both of them deficient in organization, and dependent upon mutual good will rather than general agreement for the attendance upon them. There were no recognized memberships, and no rules of order. As

now organized, the companies themselves, 178 in number, are the members, and the individuals present at the meetings are there, not as members, but as representatives of their respective companies. For this reason, while it is distinctly provided in the organization that no company is bound to put into effect any resolution of the convention to its own detriment, yet every head of a transportation department who is present at a meeting and votes in favor of any measure should, and undoubtedly does, feel himself under moral obligations to adopt the same for use on his own road.

It is not to be supposed that any set of rules, no matter how satisfactory to-day, will be found to cover all cases which may arise in the future. For this reason the Convention is likely to supplement its action by adding to its permanent organization a committee on train rules, to be appointed from year to year, to which will be referred all proposed amendments to the code of rules, and whose duty it also should be to collect information as to, and to report upon, all cases, if any, where a rule in the Uniform Code has apparently failed to meet the emergency for which it was provided.—W. F. Allen in the *Official Guide*.

An Expert Investigation.

"Suppose," said an examiner to a student in engineering, "you had built an engine yourself, performed every part of the work without assistance, and knew that it was in complete order, but, when put on the road, the pump would not draw water, what would you do?" "I should look into the tank and ascertain if there was any water to draw," replied the student.

Premiums to Section Masters.

The Fall Brook Coal Company has instituted a system of premiums in the road department which is explained in the following circular from General Superintendent G. R. Brown:

"With the year ending Sept. 30, 1888, three premiums will be given to the section foremen having the best sections on each division, as follows, viz.:

First premium, \$40.
Second premium, \$20.
Third premium, \$10.
S. G. & C. Div., from Geneva to Corning, including Penn Yan Branch.

C. C. & A. Div., from Corning to Antrim and Harrison Valley, including the Fall Brook Branch.

P. C. Div., from Stokesdale Junction to Newberry Junction.

Premiums will be based on the total number of days' work performed, including the foreman, on each section for the entire year, taking into consideration the condition of the section Oct. 1, 1887, and its condition Oct. 1, 1888, also the general average condition of the track, ditches, cleanliness of the right of way from brush, weeds, old ties, etc., during the year. Due reference will be had to different materials used on the line. These premiums are in addition to the regular monthly salaries of the foremen."

Pennsylvania Relief Department.

The monthly report of the Pennsylvania Railroad Voluntary Relief Department for September shows the following totals:

Payments for death	\$13,500
" " accident	3,007
" " sickness	6,430
Total	\$22,937

The association has since its formation early in 1886 paid 320 death benefits, 4,120 for accidents and 9,185 for sickness. The total membership now is reported as 31,000. The Baltimore & Ohio Association had at the time of its last annual report 20,297 members; and the payments for a year averaged \$19,000 per month.

Transferring a Pass.

A dispatch to the *New York Times* tells of a sensational case which culminated in the Georgia Legislature last week over the trading of a free pass. Several days ago the conductor of an East Tennessee train took up a pass issued to a member of the Legislature and presented by another and on reaching Atlanta turned the holder over to the police. The name of the member who thus gave up his pass soon became public. Mr. West, rising to a question of privilege, said:

"I have refrained from speaking upon this subject if by so doing I could shield a member of this House and screen a friend. Soon after we met here in July Mr. Perry, the Representative from Gilmer County, came to my room and stated that he wished to go out on the East Tennessee road; that he had left his pass at home and wished to get the pass issued to me over that road, as he also held a pass over the same line. I agreed to let him have it, with the understanding that he was not to let any one use it but himself, and that immediately on his return he would return the same to me. I have requested it twice since, and he stated that he would bring it soon. I was entirely ignorant of the pass having been used by any one else until it was found in the possession of a man entirely unknown to me, one whom I have never seen. He was using the pass without my knowledge, and would never have had it had I been consulted."

"I have only this to say in conclusion, I distinctly disclaim any part in the matter. I neither furnished nor assisted him in obtaining the money due the conductor when the pass was discovered. I only thoughtlessly accommodated a friend and fellow-member, with no intention to defraud the company. I am willing to bear my part of the blame in this matter, but feel that it is but just that I should make a full explanation."

South American Railroads.

The Buenos Ayres & Rosario will be extended from Sancti Spiritus to Santiago del Estero, 400 miles, the Argentine Republic having just granted the necessary concession. The company pays a 7 per cent. dividend.

English and German Railroad Service.

A correspondent of the *London Times* compares the train service of England and Germany and claims there has been little improvement in the latter since 1881, "showing that any considerable reduction by unified management has not been found practicable." He claims that the German long-distance train is six miles slower than the English, and although the traveler in England may lose an hour or more at competing points of junction, he will on the average make his journey sooner than upon the more united German lines. He estimates the passenger rate per mile as very nearly the same for third-class passengers, but grants the German roads the merit of greater punctuality than the British and raises the question whether the English service does not attempt to do more than it can safely accomplish upon schedule time. The comparison has value as illustrating the contrasted results of associated and united control.

Car Load Rates.

We understand that the soliciting agents of one of the trunk lines have been visiting shippers and suggesting that they should exert their influence with the Inter-state Commerce Commissioners to prevent a change in the new unjust differentials in classification between carloads and less than carloads, and threatening that they would advance the carload rate if they were compelled to make any change.

This is the same course pursued by the New York lines when the Anti-Discrimination bill, recommended by the Hepburn Committee, was pending in the New York Legislature. The favorite shippers were marshaled in opposition to reforms, which were afterward admitted to be necessary by the railroads themselves. Why is it that railroads thus array themselves against the very principles which it is to their interest to have obtain? It is not to their interest to develop the large shipper until he becomes a competitor, like the Standard Oil Co. and some of the other great shippers.—*American Grocer.*

Third-Class Ventilation.

Dr. Louis Czatory, delegate of the Hungarian Government at the recent International Hygienic Congress, was rather severe on European third-class cars. "If a first-class carriage was thought to be only large enough to seat six persons comfortably, why should a third-class carriage of equal or smaller dimensions be made to hold ten? The breath of a poor man gives off as much carbonic acid as that of a rich man, and the atmosphere which is breathed in a long winter's journey, third-class, is absolutely poisonous." Exactly so, but in this country our system poisons us all together without distinction if the car is not ventilated.

Railroad Geography.

Much has recently appeared on the teaching of geography, but for astute brightness, the suggestion of the advertising agent of the C., B. & Q. (vide the *Century* advertisements) is worthy of special mention. He suggests that the C., B. & Q. shall be used as a lesson on the geographical relations of the great western cities; and has published an excellent topographical map, which hangs, as we can certify, on the walls of at least one school. Wide-awake teachers have made use of this idea, too, where the word excellent could be applied to the maps only in a comparative sense, the teachers simply getting the best railroad maps they could easily find. Who knows but they can by co-operation work up an "industry" which shall be equal in pleasantness and profitability to that of the editors in the development of reduced-rate-inter-state-low-editorial-contract tickets? Railroad geography is certainly one of the most useful and most neglected of the many sorts of geographical knowledge.

Greasy Rails.

Two rear collisions occurred at Bishopbriggs, Scotland, on the North British Railway, recently, from the inability of the trainmen to control the speed of their trains because the rails for about 1,000 yards had been lubricated with rape oil, which had leaked from a cask in a freight train which had passed about an hour before.

TECHNICAL.

The Car Shops.

Business at the Michigan Car Works, Detroit, the pipe foundry and the car wheel works is on the increase, and the companies have orders on hand to keep the men employed all winter. The pay-roll at the car works for September was \$109,000, or \$9,000 more than for August.

The second and last order of cars which the Wason Co., of Springfield, Mass., has built to be run on the government road in Chili have been shipped. The company is now at work on 8 passenger coaches for the Chattanooga, Cincinnati & Chicago road. These cars are built on the patent taken out by A. B. Harris, Vice-President of the Connecticut River road, and are similar to the one built for him last winter.

The Atlanta Car Co., capital stock \$100,000, has been chartered in Georgia to build and repair cars and manufacture nuts and bolts, by C. K. Maddox, C. E. Lucas, J. N. Porter, J. M. McAllister, James Banks and others.

The car construction works of the Rathbun Co., Deseronto, Ont., established for the purpose, in the first place, of building stock for the Napanee, Tamworth & Quebec road, has been considerably extended, and is in a position to execute orders from others as well. Some cars are now being turned out for the Canadian Pacific.

The car works at Fullerton, Lehigh County, Pa., have resumed operations after an idleness of two years, and the new plate-mill at the same place will start up soon, giving employment to several hundred hands.

Bridge Notes.

The Columbia River Bridge Co. has filed articles of incorporation in Portland, Ore. The object of the enterprise is to construct a bridge across the Columbia River from the Oregon side to La Camas, W. T. The incorporators are: H. S. Rowe, D. H. Stearns, R. L. Durham, M. C. George and H. L. Pitcock. The capital stock is \$500,000.

The Milwaukee Bridge Co. has contracted with John Esson, of Detroit, Mich., to put in the substructure of the Belle Isle Bridge. The contract will amount to \$75,000 or \$80,000.

The Smith Bridge Co., of Toledo, O., have received the contract to build a bridge at Waterville, O.

Manufacturing and Business.

The Bay City Railway Spike Co., Bay City, Mich., will establish works at Fremont, O.

The Le Gross Car Roofing Co., Louisville, Ky., will erect a factory for manufacturing patent roofing.

The National Locomotive Spark-Arrester Co. has been incorporated in Illinois; capital stock, \$150,000; incorporators, Thomas Plunkett, W. R. Paige and I. H. Kennard.

The Rood & Brown Car Wheel Works, of Buffalo, N. Y., have added three extra cranes and ten annealing pits, which will increase their capacity 200 wheels a day.

M. Hardsoc, the mining drill manufacturer, Ottumwa, Ia., reports the following sales: Atchison, Topeka & Santa Fe Railway Co., Frontena, Kan., 50 drills; Poole & Co., Rendville, O., 16; Parke County, Rosedale, Ind., 6; Citizens' Coal Mining Co., Lincoln, Ill., 6; Sunday Creek Coal Co., Columbus, O., 12; Indiana Mercantile Co., Rosedale, Ind., 6; Keith & Perry Coal Co., Scammonville, Kan., 9.

The Westinghouse Electric Co., of Pittsburgh, has been awarded the contract for lighting the Senate Chamber of the Capitol at Washington. This contract calls for 1,300 electric lights, which will include all candle-power from 9 to 16, 25, 50, 75, 100 and 150. The entire plant will be placed in the building, including the power, machinery and other essentials.

The Carlisle Manufacturing Co., of Carlisle, Pa., has taken a contract for 50,000 Stinson improved car axle boxes.

The United States Electric Railway Signal Co., capital stock \$500,000, has been incorporated at Ashland, Ky., by John H. Crook, Oscar J. Cohn and William B. Sterrett. The object of the company is to manufacture electrical appliances, etc., which will be principally carried on in New York.

Mr. S. R. Smythe, Secretary of the Swindell Construction Co., Pittsburgh, Pa., reports that his company has been awarded a contract by the Syracuse Tube Co., of Syracuse, N. Y., to erect for them complete a tube-welding gas furnace, having a working hearth 26 ft. long by 7 ft. wide, and also a block of four improved gas producers, including the necessary conduits, etc.

Messrs. W. & B. Douglas, of Middletown, Conn., have purchased a new 75 horse-power Harris & Corliss engine which they are to put into their works Thanksgiving week. This en-

gine is to take the place of one which has been in use since 1846 and which was entirely built by Mr. William Douglas.

The St. Louis Car Wheel Co. is erecting extensive new buildings to replace those destroyed by fire, and early next month will be turning out the first wheels from this new establishment. The main foundry building will be 65 x 445 ft., made from corrugated iron, and having glass skylight throughout its entire length on both sides of the roof. Adjoining on an end will be the building for wheel pits about 60 x 60 ft. Other smaller and necessary buildings will be added, to make complete those taking the places of the ones burned.

The Ensign Manufacturing Co., of Huntington, W. Va., is building an additional car wheel foundry, 70 x 146 ft., with a Collium cupola and a capacity of 200 car wheels per day, and a new erecting shop for freight cars, 86 x 208 ft.

Messrs. Hunt & Clapp, of Pittsburgh, Pa., report the closing of a contract with the Columbia Iron & Steel Co., of Uniontown, Pa., of 15,000 ft. of magnesia sectional covering for their pipes and boilers.

Iron and Steel.

A charter for a corporation to be known as the Oliver Iron & Steel Co., of Pittsburgh, Pa., has been applied for. The incorporators are: Henry W. Oliver, Jr., David B. Oliver, James B. Oliver, John Phillips and John Smith. The capital stock of the new company will be \$1,500,000. It is a consolidation of the present Oliver Brothers & Phillips concerns with a limited liability.

The large foundry room of the Chattanooga, Tenn., Iron Works, 60 x 80 ft., has been completed and the new 30 ton crane placed in position.

Work has been commenced on the foundation of the new rail mill to be erected at Jackson, O. The building is to be 33 by 110 feet, brick walls and metal roof.

The North Star Iron-Works, of Minneapolis, has made arrangements to put in a large plant at Oakland, a suburb of St. Paul, Minn. The land has already been secured from the Union Land Co., and work will be commenced at an early day.

The Johnson Steel Street Rail Co. has decided to locate its new works on the Von Lunen farm, close to Johnstown, Pa., where 190 acres of land has been purchased. Furnaces and rolling mills in addition to the present works at Woolvale will be erected. The company will at once lay a railroad track from the new location to Johnstown.

A company, to be known as the Continental Steel Car-Wheel Co., is being organized at Norristown, Pa., for the manufacture of rolled steel car-wheels, under Col. Theodore W. Bean's patents.

The Leeburg Foundry & Machine Co., of Pittsburgh, Pa., with a capital stock of \$50,000, will erect a foundry and machine shops at Leeburg in the near future.

The Glendon Iron Wheel Co., of Toledo, O., is building a \$200,000 factory, and the foundations have been laid for the new rail mill, 330 by 110 ft., at Jackson, Ohio.

The Chicago Steel Works started their fires in September, but their machinery was not complete until a short time ago, when they put in their 21-ton shears for cutting steel rails into billets for rolling.

The Nashville Iron, Steel & Charcoal Co. has recently made with the Lawrence Iron Co. a contract for a full supply of clean-washed brown hematite ore from the mines in Lawrence County, for its two furnaces for 10 years from Jan. 17, 1888.

The Kansas City & Sabine Pass Coal & Iron Co. has been incorporated in Kansas. Capital stock, \$5,000,000. Directors: William Anderson, Daniel J. Haynes, of Kansas City, Mo.; Edward L. Sperry, Charles Watson, Charles Van Horn, of Kansas City, Kan.; Harrison M. James, Fred. M. Dey, of New York City. The principal office of the company will be at Kansas City, Kan.

The Rail Market.

Steel Rails.—The sale of a 5,000 ton lot by a Western mill is reported, and it is said that several large negotiations are being made with trunk lines. Quotations: \$32@33 for standard sections at Eastern mill.

Old Rails.—Market continues dull, and no sales are reported except a few small lots at cash. Quotations: Tee, \$21.50@21.75, and double heads, \$22@22.50.

Track Fastenings.—Quotations: Spikes, 2 25@2.40c.; angle bars, 2.05@2.15c.; bolts and nuts, 3@3.25c.

Car Heating Notes.

The Grand Trunk will try the Weston system of steam heating on cars of the Cornwall branch, and the Sewell system on the Ottawa section.

It is stated that an amalgamation of the Willhames and the Pennycuik systems of heating is probable, and that negotiations for that purpose are nearly completed.

A new device, owned by the Erie Car Heating Co., of Erie, Pa., and recently tested in the presence of a number of Western railroad officials at Chicago, is especially designed to overcome the difficulty in making durable connections between cars for the passage of steam. It consists of flexible coils of the best seamless spring brass tubing at each end of the car, the ends of the coil forming an expansion joint entering a coupling of metal like a piston. The connection can be readily made or broken, and the invention will take up any motion of the train, the shortest curves having no more effect on the joints than the even track. The device, it is claimed, will fully take up the motion of the ordinary train.

The Minnesota Car Heating Co., of St. Paul, has applied for a patent on a system of steam heating which is said to be very simple. It is claimed that the apparatus on the engine will weigh only 300 lbs., and the radiators on each car 1,200 lbs., 120 sq. ft. of heating surface being provided. A cheap and non-corrosive fluid will be used to store sufficient heat to keep the car warm for three hours. Reckoning that 60 lbs. of steam will keep a car warm for one hour when the thermometer is at zero, the consumption of coal, if live steam were used, would be about 72,000 lbs. for a 6-car train during the winter. It is, however, possible that exhaust steam may be used almost exclusively, in which case the extra consumption of fuel would be very small.

Parchment Journal Bearings.

Experiments are being made on Prussian railways with axle boxes fitted with bearings of vegetable parchment in place of brass. The parchment is strongly compressed before being used, and it is thoroughly dried to prevent subsequent shrinkage. Wooden rings are placed on the outside of the bearings, fitting the collars of the journal. An emulsion of water and oil and various mineral oils have been used as lubricants. The parchment soon becomes impregnated with oil, and will run a long time without a renewal of lubrication. The parchment segments are placed perpendicular to the journal. The claim is made that these compressed paper bearings make a tough material that is superior to metal. Such bearings are also in use in a German saw-mill with satisfactory operation.

European Ship Canals.

The project for a canal from Bordeaux to Narbonne, uniting the Bay of Biscay with the Mediterranean, is again attracting attention, a company having undertaken to make the necessary survey.

The scheme as it is now proposed is to start from Bordeaux

and follow the left bank of the Garonne to Castel-Sarrasin, when the river is to be crossed on an aqueduct, and the right bank followed to Toulouse. The canal will be 330 miles long, saving about 680 miles over the Gibraltar route for vessels trading from England to the Mediterranean, and will be 24 ft. deep, unless the government wish to use it for iron clads, in which case it will be 27 ft. deep. The running radius of curvature will be 6,000 ft. (0.57°), the same as on the Suez Canal. It is proposed to lay a railroad track on each bank of the canal, and tow vessels through at the rate of 7 miles per hour. This plan will afford a grand opportunity for studying the effect of ships' models in the wave developed by rapid motion in narrow channels, and will doubtless be more economical even for propellers than the use of their own power. There will be 38 locks, with lifts varying from 20 to 30 ft.

The Manchester Ship Canal Company, according to the *Bullionist*, paid £1,710,000 for the Bridgewater Canal, which was £720,000 more than it was sold for in 1873 by the late Lord Ellesmere; or in other words, as the canal was renting for £50,000 per annum net, the payment was equal to nearly 35 years' purchase. This payment, however, is understood to have included certain attorneys' fees, and Americans who were in London last spring and summer heard hints in that connection of what would be called boodle in this country.

Electric Safety Lamps for Mines.

Mr. Page, Secretary of the (English) Edison & Swan Electric Light Co., says that 600 perfected safety lamps for mines will soon be ready, and will be exhibited when Sir Frederick Abel reads a paper on the electric safety lamp at the next meeting of the Institution of Civil Engineers. The miners are so much interested in the matter that they have expressed willingness to purchase at their own expense if the new lamps are not provided by the mine owners.

Nut Locks.

An interesting trial was made lately on the Southern Pacific as to the efficiency of nut locks. Forty Central Pacific standard track bolts were fitted with the Noble nut lock, forty with the Verona, and the same number were used without any nut locks. The three styles were placed in alternate points between Bay and Mastic stations on the Alexandria branch of the Western division in August, 1884. The rails were steel and weighed 50 lbs. per yard. The following table shows the number of nuts tightened up in each month:

	Noble nut lock.	Verona nut lock.	Without nut lock.
August, 1884.....	None	None	20
September, 1884.....	3	5	18
October, 1884.....	None	4	20
November, 1884.....	None	4	12
December, 1884.....	None	8	16
January, 1885.....	None	4	10
February, 1885.....	None	5	10
April, 1885.....	None	5	12
Total, 8 months.....	3	35	118

It thus appears that each bolt without a lock nut required to be tightened up about every three months, while each bolt fitted with a Verona lock nut would, according to these results, run about 10 months before getting loose. The Noble washer, the invention of Mr. L. C. Noble, Master Mechanic of the Houston & Texas Central, shows even better results.

Continuous Brakes in England.

The recent Board of Trade returns show that with the exception of one or two lines all main line trains and the majority of branch line trains are fitted with continuous brakes. The number of vehicles fitted with the different descriptions of brakes, the percentage which they bear to the total and the percentage of miles run by trains fitted with the continuous brakes for the six months ending June, 1887 and 1886, are shown below:

	Fitted.		Per cent. fitted.		Miles run. Per cent.	
	1886.	1887.	1886.	1887.	1886.	1887.
Clark's Chain and	2,516	2,024	5	4	4	4
Clark & Webb's	1,809	1,601	3	2	1	1
Fay's, Newall's &	5,923	6,081	11	12	17	17
Fay & Newall's	3,609	4,274	7	8	10	10
Smith's vacuum	10,008	11,907	19	22	21	24
Vacuum	11,203	11,788	22	22	28	28
Westinghouse automatic	35,341	37,462	68	71	84	86
Totals United Kingdom						

The chain brakes are being largely replaced by a form of vacuum brake, while the Fays and Newall's brakes (which are really hand brakes connected to work together on several vehicles) are being replaced with the automatic vacuum. The Smith's vacuum is being altered and made automatic, and cylinders with metallic piston and rolling rubber ring substituted for the original vacuum sack.

The number of engines fitted with brakes which comply with the Board of Trade requirements (automatic), 52 per cent.; engines fitted with continuous brakes which do not comply (non-automatic), 40 per cent.; engines not fitted with any form of continuous brake, 682, or 8 per cent. About 42 per cent. of the engines are fitted with apparatus for working the continuous brake, which is not, however, applied to the drivers. Most of these engines have, however, a steam driver brake, which in many cases can be worked with the same handle that applies the continuous brake to the cars.

No progress appears to have been made in fitting continuous brakes to freight trains, but the use of steam driver and tender brakes on freight engines is becoming very general, and most of the fish cars that are run on passenger trains are fitted with pipes and hose.

Compound Railroad Sleepers.

Mr. C. Renson, of the Netherlands State Railways, has devised a means of using up old wooden sleepers. Sleepers generally fail where the rail rests, leaving a sound length of about 3 feet in the centre. Two such pieces are joined end to end by a piece of channel iron. The rail rests on the channel iron, which thus prevents it from wearing into the sleeper.

Piston Valves for Locomotives.

According to M. Ricour, piston valves in locomotives wear at the rate of $\frac{1}{16}$ in. for 125,000 miles, while with the slide valve the same extent of wear takes place with one-sixtieth of the mileage. The wear of the valve gear is reduced in the same proportion. The effect in the consumption of fuel is shown by the returns made at Saintes Station for the year 1882, where on all engines worked with slide valves the coal consumed per 1,000 tons conveyed one mile was 226 lbs., against 234 lbs. in the year 1884, when 30 out of 40 locomotives had been fitted with cylindrical valves.

Rack Railroad in Sumatra.

A rack railway, similar to that up Mount Washington, is being built in the island of Sumatra, by Mr. August Kuntze, a German engineer. The larger portion of the sleepers, rails, engines and cars has been supplied by German manufacturers.

Steel Steamer for Lake Champlain.

At Shellburn Harbor, Nov. 1, the new steel steamer Chateaugay was launched by the Lake Champlain Transportation Company. The Chateaugay is the first steel vessel ever constructed for these waters. Her length is 200 ft., beam 30 ft. and depth of hold 10 ft. 6 in. The hull was constructed by the Harlan & Hollingsworth Company, of Wilmington, Del. Her boilers and machinery were built by the W. and A. Fletcher Company, of New York.

Locomotive Trade in Germany.

The building of locomotives in Germany, says the correspondent of *The Engineer*, is becoming from day to day more deplorable and profitless; the few state locomotives which were given out were only to be obtained at prices under the cost of making, and the prices of those for private parties and for abroad have gone down in the same ratio. Germany's next neighbor, Holland, is seeking to make its own requirements, at least tramway locomotives, which were formerly offered to German works. A larger number of hands would consequently have had to be discharged from German factories, if at some of the public tenderings for locomotives orders had not been taken at prices below those of production. The general slackness of trade has been severely felt by the car works. Since the state has taken over the railways it has become possible to better utilize the rolling stock, which has had a paralyzing effect on demand, and few cars have been ordered, whereas in former years car building gave abundant work. A part of this falling off in the trade was recouped by orders for passenger coaches, post and covered wagons; but the great competition causes the prices to hardly cover prime cost.

The Central Railway Club.

This club meets the fourth Wednesday of January, March, May, August and October. The President is Mr. Thos. Sutherland, Master Car-Builder, Chicago & Grand Trunk, Detroit. The Secretary is Mr. E. Chamberlain, Master Car-Builder, New York Central, Buffalo, New York. The membership is about 60. The meetings have always been quite informal, and altogether the club is older than perhaps any other of the local railroad clubs, it was formally organized only in last spring. The subjects discussed have always been rather those of administration and organization than mechanical. In fact, the meetings have been held principally for the adjustment of differences of opinion and practice among the officers of the roads centering in Buffalo. The headquarters of the club are at Buffalo, although the membership includes a good many officers who are stationed at some distance from that city.

Westinghouse vs. Carpenter.

We are informed that the preliminary injunction preventing Carpenter's use of his air-brake coupling will expire in April, 1887, by reason of the English patent No. 1540, a prior grant, which limits the life of the Westinghouse patent, unless, meantime, Mr. Westinghouse secures an extension of his patent. The Carpenter Electro-Air Brake Co. has been organized with a capital of \$1,000,000, and expects to have its works in Chicago and enter into active competition for the brake business next spring. Mr. Carpenter will spend the intervening time in perfecting his apparatus and getting the works in running order.

Bids for the Harlem Ship Canal.

Bids were opened Wednesday for excavating 150,000 cubic yards of material, across Dyckman's meadows, on the line of the Harlem Ship Canal. The section includes considerable rock cutting. There were some 14 bids ranging from \$525,000 down to \$154,500. There were two bids at the highest figure. The lowest bidder was John Satterlee, of Englewood, N. J.

The Poughkeepsie Bridge.

The first truss of the bridge across the Hudson River at Poughkeepsie was finished and swung clear on Nov. 7. The Lehigh Valley has made a contract with McKee, Fuller & Co., of Catasauqua, Pa., for the construction of 500 freight box cars.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings of the stockholders of railroad companies will be held as follows:

- East Tennessee, Virginia & Georgia*, annual meeting, at the office, Knoxville, Tenn., Nov. 16.
- Western, New York & Pennsylvania*, at the office, Nov. 22.
- Boston & Albany*, annual meeting, Boston, Dec. 14.
- Fort Worth & Denver City*, annual meeting, at the office, Fort Worth, Tex., Dec. 13.
- Mobile & Ohio*, annual meeting, at the office, New York, Nov. 21.
- Old Colony*, annual meeting, United States Hotel, Boston, Nov. 22.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Boston & Maine*, \$5 per share, payable Nov. 15.
- Chicago & Alton*, quarterly, \$2 per share, payable Dec. 1, to stockholders of record on Nov. 15.
- Cleveland & Pittsburgh*, 1½ per cent., quarterly, payable Dec. 1.
- New York, Providence & Boston*, 2½ per cent., quarterly, payable Nov. 10.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

- The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.
- The *New England Railway Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.
- The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.
- The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.
- The *Western Railway Club* meets in Chicago the third Wednesday in each month.

Engineers' Society of Western Pennsylvania.

At the meeting on Oct. 18, Mr. Ramsey read a paper on the effect of temperature upon structural iron and steel. He gave tables showing the results of a number of experiments on iron at different temperatures, ranging from zero up to 80°. The conclusions from these tests were that bars tested under low temperature gave uniformly a more crystalline fracture and broke with less blows of the drop than when tested at higher temperatures. Mr. Ramsey's conclusion was

that in specifications for structural iron certain temperature tests should be prescribed—that is, that bending tests should be made at comparatively low temperatures to show the character of the fracture at such temperatures. Naturally, the paper aroused much discussion, and of course there was very much dissent from Mr. Ramsey's theory. Few of the members are prepared to admit that a low temperature made any dangerous change in the internal structure of iron or steel.

Western Railway Club.

The next meeting of this club will be held in the Grand Pacific Hotel, Chicago, Wednesday, Nov. 16, at 2 p. m. The subjects for consideration are as follows:

- 1st. Extension smoke-boxes and brick and other fire-box arches. This subject will be introduced by Mr. John Hickey, General Master Mechanic Milwaukee, Lake Shore & Western.
 - 2d. The relative strength of sap and heart in Norway pine, especially relating to sills of freight cars. A short paper on this subject, will be read by Mr. W. L. Brown, Chemist Chicago, Burlington & Quincy.
 - 3d. Standard axle for 60,000-lb. car. This subject is continued from last meeting.
- The Secretary adds to this announcement the following: "The investigations and experience of railroad officers often bring out incomplete information, which might frequently be supplemented advantageously by facts in the same line discovered by others. Short papers, on subjects of this character, that could be read in about five minutes, could be easily prepared, and would be the basis for valuable discussions. The Executive Committee wish to urge members and others, having information of this kind to present it in the way suggested."

American Society of Mechanical Engineers.

The eighth annual meeting (XVth) of this society will be held in the city of Philadelphia, Pa., beginning Monday evening, Nov. 28, and ending Friday, Dec. 2.

The business sessions of the Convention will be held in Parlor C, of the Continental Hotel, corner of Ninth and Chestnut streets. The headquarters and Secretary's office will be at Room No. 27 on the first floor.

The programme of sessions is as follows: Monday evening, Nov. 28, at 8 p. m., first session, President's annual address.

Second day, Tuesday, at 10 a. m., business session, reports of committees and general administrative details. After these the professional papers will be taken up. The afternoon will be left free for members to visit different manufacturing establishments, who have extended invitations. In the evening, at 8 p. m., third session for professional papers and discussion.

Third day, Wednesday, at 10 a. m., fourth session for professional papers and discussion. Fifth and concluding session at 2:30 p. m. On Wednesday evening a reception is tendered to the Society at the Academy of Fine Arts, being the occasion of a private or first view of a special collection of portraits, together with the regular pictures of the Academy.

Fourth day, Thursday, excursion by special train to Bethlehem, Pa., leaving by P. & R. R. at 9:15 a. m., returning to reach the hotel at 5 p. m. This visit will be to the new plant of the Bethlehem Iron Co., also to the Lehigh University and to the Lehigh Zinc Works. In the evening a complimentary dinner will be given to the members by citizens of Philadelphia.

Invitations have been received from many establishments and institutions to visit them during the sessions of the society.

The following papers are to be presented and discussed at this meeting:

- Lewis F. Lyne: "The Use of Kerosene Oil in Steam Boilers."
- Henry I. Snell: "Method of Ventilating and Heating Office and Warehouse."
- John E. Sweet: "A New Principle in Piston Packing."
- R. H. Thurston: "Internal Friction of Non-Condensing Engines."
- John J. Grant: "The Milling Machine as a Substitute for the Planer."
- Henry I. Snell: "Centrifugal Fan Blowers and the Power to Drive Them."
- John Coffin: "Steel Car Axles."
- Oberlin Smith: "Power Press Problems."
- Frank Van Vleck: "Standard Section Lining."
- Percy A. Sanguinetti: "Divergencies in Flange Diameters in Pumps, etc."
- Wm. O. Webber: "Centrifugal Pump Efficiencies."
- Gaetano Lanza: "Friction of Toothed Gearing."
- Jerome Sondericker: "How to Test Strength of Cements."
- H. deB. Parsons: "Influence of Sugar upon Cements."
- James M. Dodge: "New Method of Stocking and Reloading Coal."
- E. C. Felton: "Results obtained from Steel Tested Shortly after Rolling."
- O. C. Woolson: "Road-bed for Railroad Bridge Structures."

Subjects and queries will also be presented for the topical discussions, which have proved so interesting and profitable at the recent meetings. The series of queries is given below, and the Secretary will be glad to receive any written discussion of any of them from members who cannot attend the meeting. Such communications will be read at the meeting as part of its proceedings.

The queries proposed are:

50. What is the best form of pump to use with driven wells, where lift is 10 to 20 ft., and air is likely to get into the suction. Should the pump be single or duplex, and with piston or plunger?
51. Have you used driven wells successfully; of what sizes and depths, and singly, or in groups?
52. Are roller bushings expedient in journals at low velocities and under high pressures?
53. What is the best material for lining brake-straips on elevators, cranes, etc.?
54. What is the best way to secure tight fit of set-screws tapped into heavy parts of a machine?
55. How much should be removed from the edges of punched or sheared steel plate to cut away the injured metal?
56. Have you used power molding machines successfully in the foundry?
57. What makes the best molds for complicated steel castings to secure solidity and freedom from shrinkage cracks?
58. What is the effect of adding small per cents. of wrought-iron or steel scrap in the foundry cupola or ladle?
59. What kind of pig-iron gives the best results in light castings where easy tool-treatment is the essential rather than strength?

PERSONAL.

—J. H. Goodspeed has resigned the position of Auditor of the Mexican Central.

—F. Broughton has resigned the position of General Manager of the Chicago & Atlantic.

—Gen. J. T. Dodge has resigned the position of Chief Engineer of the Montana Central.

—George Straub, a director of the Chicago & Atlantic, died suddenly in Chicago on Nov. 7.

—Mr. John Bogart, Secretary of the American Society of Civil Engineers, is elected State Engineer of New York.

—James T. Gardner has resigned the position of General Superintendent of the Buffalo, Rochester & Pittsburgh.

—A. Gottlieb has accepted the position of Consulting Engineer for the Mount Vernon Bridge Co., of Mount Vernon, O.

—R. C. McCalla, Chief Engineer of the Tuscaloosa Northern, was seriously and probably fatally injured on Oct. 25 by being thrown under the wheels while attempting to board a moving train.

—Hon. James Bedington, of Waddington, Quebec, has tendered his resignation as President of the Ottawa, Waddington & New York Railway & Bridge Co. He resigns on account of his advanced age, which is 77 years.

—Virgil Powers has retired from the office of General Commissioner of the Southern Railway and Steamship Association. At the meeting in Atlanta, Ga., held on Oct. 25, the following resolution was offered and unanimously adopted: "Whereas, Mr. Virgil Powers, having been connected with the Southern Railway and Steamship Association as General Commissioner more than 11 years ago, and having occupied this responsible position during the difficult and stormy period of its existence, when at times it seemed that dissolution was inevitable, and having met every emergency with great dignity, energy and ability, and having given great satisfaction to the Association by the able manner in which he has discharged his duties, and he having indicated a disposition, on account of advancing age, to retire from the active duties of the position, it is hereby

Resolved, That the convention accept Mr. Powers' retirement from the active duties of Commissioner with deep regret; and that he retire with the fullest confidence of the Convention, and with their highest commendation for the manner in which he has discharged the arduous labors devolving upon him during his active connection with the Association."

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—P. J. Flynn has been appointed Assistant Superintendent in direct charge of the Denver terminals, including the Denver Circle road and the portion of the Denver extension north of Denver, Texas & Gulf crossing.

Baltimore & Ohio.—Senator Gorman, of Maryland, has been appointed a State Director.

Burlington, Stillwater & Duluth.—The incorporators of this Minnesota company are: E. W. Durant, R. F. Hersey, Samuel Mathews, A. K. Doe and J. N. Searles, of Stillwater, and C. H. Graves and G. G. Hartley, of Duluth.

Canadian Pacific.—Judge Clark, of Cobourg, has been appointed Chief Solicitor, vice J. C. Abbott, who goes on the board of directors.

Duluth & Iron Range.—At a meeting in Chicago last week the following directors were elected: H. H. Porter, Marshall Field, Chicago; H. R. Bishop, Roswell P. Flower, Benjamin Brewster, D. O. Mills, David Dows, H. M. Flagler, New York; George H. Bath, Boston; P. H. Kelly, George C. Stone, St. Paul; C. Tower, Jr., Duluth. The following officers were elected: Chairman of the Board, H. H. Porter; President, H. R. Bishop; Vice-President, Richard H. Lee; Treasurer and Secretary, C. W. Hillard, Chicago; Assistant Treasurer, W. T. Paterson, New York; Executive Committee, H. H. Porter, H. R. Bishop, Benjamin Brewster, R. P. Flower, C. Tower, Jr.

Housatonic.—W. H. Starbuck has been elected President, and W. H. Starbuck, John McCauley and A. J. Porter directors.

Indianapolis, Decatur & Springfield.—L. A. Boyd has been appointed Acting Superintendent, vice G. W. Bender, resigned.

Long Beach.—The directors of this company are: E. B. Cushman, H. B. Wilsbire, H. G. Wilsbire, S. M. White and John D. Bicknell, all of Los Angeles, Cal.

Louisville, Cincinnati & Dayton.—The following directors have been elected: George C. Evans, George A. Evans, Austin Gallagher, Jos. P. Pennington, Chas. A. Korbly, J. K. McCracken, Jas. P. Helm, Chas. E. Golay and J. C. Fawcett.

Louisville, New Albany & Chicago.—A. Bubbe has been appointed Purchasing Agent, and R. W. Glading has been made Freight and Passenger Agent at Thomasville, Ga., whither he has gone to recover his lost health.

Manhattan.—In the election of directors and officers this week only one change was made, Edwin Gould being elected to the directory in place of Edward M. Field.

Maryland & Delaware Canal.—L. S. Phillips has been elected President, John Stevens Secretary. Directors, L. S. Phillips, John Stevens, Horace B. Tibbits, Norvin Green, W. J. Roe, John Mullaly, J. J. Alexander, Joseph Biggs and Robert Derrickson.

Mexican Central.—Charles E. Miner has been appointed General Traveling Agent in the United States, office at El Paso, Tex.

Milwaukee & Northern.—C. F. Dutton has been appointed General Manager.

Montana Central.—E. H. Becker has been appointed Chief Engineer, vice Gen. J. T. Dodge, resigned.

New York, Lake Erie & Western.—J. F. Maguire has been appointed Assistant Superintendent and Trainmaster of the Northern of New Jersey and the New York & Greenwood Lake, with headquarters at Jersey City.

New York, Pennsylvania & Ohio.—J. F. Caldwell, W. H. Goss and A. W. Ball have been appointed Road Foremen of Engines on the Eastern, Mahoning and Western Divisions, respectively. The position is a new one on this road.

Northwestern North Carolina.—Jos. G. Brown has been appointed Commissioner, vice D. A. Jenkins, deceased, to look after the state's interest in the road.

Northern Pacific.—Thomas J. DeLamere has been appointed Superintendent of Transportation, with headquarters at St. Paul, Minn. S. L. Moore has been appointed General Freight Agent, headquarters at St. Paul.

Pittsburgh, Marion & Chicago.—N. F. Wood has been appointed General Manager, with headquarters at New Lisbon, O.

Prescott & Arizona Central.—The following directors were elected last week: T. J. Butler, T. S. Bullock, L. H.

Wilson, H. C. Nutt, Wm. N. Kelly, Geo. Manchester, W. E. Hazletine, Levy Bashford and E. T. Smith. At a meeting of the board of directors the following officers were elected: T. S. Bullock, President; T. J. Butler, Vice-President; Wm. N. Kelly, Secretary; W. E. Hazletine, Treasurer; Hon. Sumner Howard, Solicitor. Executive Committee: T. S. Bullock, W. N. Kelly, Levy Bashford; T. S. Bullock, General Manager; L. H. Wilson, Auditor.

St. Joseph & Grand Island.—J. E. Price has been appointed Traveling, Freight and Passenger Agent.

Seattle, Lake Shore & Eastern.—The present officers were re-elected last week.

Topeka, Silver Lake & Rossville.—The directors are: J. C. Watt, A. J. Arnold, S. N. Bergen, A. W. Riley, J. Q. A. Peyton, J. M. Bryan, M. Campbell, Ed. Buechner and G. Stoker. The following are the regular officers of the company: J. C. Watt, President; S. N. Bergen, Vice-President; A. J. Arnold, Secretary; J. Q. A. Peyton, Treasurer.

Wabash Western.—George W. Ogilvie has been appointed Superintendent of the Des Moines & Northwestern; L. T. Martin, Superintendent of the St. Louis, Des Moines & Northern, and Superintendent McGee, of the Missouri Division, will also have charge of the Wabash line in Iowa, extending to Des Moines. All of these changes are to fill the vacancies caused by the resignation of C. F. Meek.

OLD AND NEW ROADS.

Aberdeen, Bismarck & Northwestern.—The road is graded into Bismarck, Dak., and will be continued north to the coal fields of McLean County, 45 miles from Bismarck. The report that the road has been sold to the Minneapolis & Pacific is denied.

Allegheny Valley.—The court has authorized the Receivers to pay out \$250,000 from the fund in their possession as part of the interest due on the \$10,000,000 worth of indebtedness against the company.

Americus, Preston & Lumpkin.—The road is completed from Americus, Ga., to the Altamaha River, and trains are now running by the new route to Brunswick.

Arkansas, Kansas & Colorado.—Grading on this road between Dodge City and Buckline, Kan., is completed. It is expected to have the road in operation by Dec. 1.

Atchison, Topeka & Santa Fe.—The company has built a cut off some three miles long on the east side of the city of Wellington, Kan., connecting its track with the Southern Kansas, which will be used to bring the trains of the former into a union depot now building. The Atchison has taken possession of all lines of the Southern Kansas west of Wellington, and is now operating them under the name of the Panhandle Extension.

M. K. Martin, of Rich Hill, Mo., is grading the first 20 miles of road eastward from Fort Scott, Kan., on the company's Missouri division.

Atlanta & Florida.—The Georgia Legislature has changed the name of the Atlanta & Hawkinsville as above. Eighty miles of the road between Atlanta and Fort Valley are graded and the remaining 20 miles will be graded by Dec. 15. Tracklaying is progressing rapidly.

Baltimore & Ohio.—The Court has dismissed the injunction suit of the Grafton & Greenbrier Railroad against this company. The case has been in the courts of West Virginia for some time, and now that it is settled it is stated that the Baltimore & Ohio will extend its road as far as Buckhannon, W. Va., this winter, and probably to Braxton in the spring.

Baltimore & Ohio.—The fight for terminal facilities in Zanesville, O., started afresh this week, when the Zanesville, Mt. Vernon & Marion undertook to lay track over property purchased by the Baltimore & Ohio. The opposing forces confronted each other, one with a determination to do and the other to undo things; and, serious trouble seeming imminent, a company of militia and a Gatling gun were sent to the scene. The intimidation was effective, the Baltimore & Ohio men dispersing, leaving the others in peaceful possession.

Boston & Providence.—The directors of the Old Colony road have voted to lease this road for 99 years, at 10 per cent. on the capital stock and a bonus of \$1,000,000. A majority of the stockholders of the Boston & Providence have already signified their willingness to accept the terms.

Burlington, Stillwater & Duluth.—Incorporated in Minnesota. The company proposes building a road from a connection with the Chicago, Burlington & Northern at Prescott along the east bank of the St. Croix River to Stillwater, across the lake to St. Croix Falls, Wis., and thence by an independent line to Duluth, Minn. Capital stock of company, \$3,600,000.

Carthage & Cameron.—The road is now graded from Cameron to within 3 miles of Carthage, N. C., and it is expected to have it completed by next January.

Central of Georgia.—It is rumored that the company will build a line from Eden, 20 miles east of Savannah, Ga., to Fort Valley, to connect with the Columbus & Western. The company has contracted with John Roach & Sons for a new freight steamer of 2,300 tons burden.

Central Massachusetts.—The road is completed from Ware to Northampton, Mass., 26 miles. The bridges on the line are nearly completed. Stations will be built at Bonds-ville, Belchertown, Amherst and Hadley. Trains will be run to the station of the Connecticut River road at Northampton.

Chattanooga, Rome & Columbus.—It is the Chattanooga Brick Co., of Atlanta, Ga., that has the contract for building 100 miles of this road. The entire line from Chattanooga, Tenn., to Columbus, Ga., will be completed by January, 1889.

Chicago & Alton.—The company has formed a new freight line to be known as the "Knox line," made up of the following roads: Chicago & Alton, to Dwight, Ill.; Indiana, Illinois & Iowa, to Knox; the New York, Chicago & St. Louis, to Buffalo; and the New York, Lake Erie & Western and connections to New York and other points.

Chicago, Burlington & Quincy.—It is stated that the company will build a track from Wyauet, Bureau County, Ill., to Colona, Henry County, to connect with its line from Rock Island to St. Louis, passing through the towns of Mineral, Annawan, Atkinson, Geneseo, Green River and Colona.

Chicago, Milwaukee & St. Paul.—The distance from Ottumwa, Ia., to the junction with the Belt Line road in Kansas City, Mo., which constitutes the extension recently completed by this company, is 203 miles.

Chicago & Eastern Illinois.—The consolidation of this company with the Strawn & Indiana State Line, the Mo-

menace & State Line, the Chicago, Danville & State Line, and the Eastern Illinois & State Line has been successfully accomplished. It is probable that the Chicago & Eastern Illinois will be consolidated with the Chicago & Indiana coal road.

Chicago & Northwestern.—The extension of the Dakota Central road from Verdon, Brown County, Dak., to Groton, 14½ miles, was opened for business on Nov. 7.

Chicago, Rock Island & Pacific.—It is said that it is the intention of this company to push forward to Denver next year, and the graders will be kept at work as long as possible this winter. Track is now laid to Mankato, Kan., and the grading is completed to Phillipsburg, to which point the road will be opened by the middle of this month.

Cincinnati, Indianapolis, St. Louis & Chicago.—The branch road to Aurora, Ind., has been opened.

Columbus & Western.—Trains on this road will run through from Columbus to Syllacuga, Ala., on Nov. 15.

Concord.—The company is to immediately put the Nashua, Acton & Boston in first-class condition for through business. New steel rails will be laid, additional side tracks put in, and the road thoroughly repaired. The line extends from Nashua, N. H., to Acton, Mass., 20 miles.

Davenport, Iowa & Dakota.—Work will begin at once on this road. The line starts at the western end of the city of Davenport, Ia., and extends northwesterly through Anamosa and Independence into Dakota.

Denison & Washita Valley.—The contract to build the extension to the coal fields at Lehigh, I. T., about 80 miles, has been let to W. E. Springall, of Dallas, Tex.

Denver, Memphis & Atlantic.—The company, which is controlled by the Missouri Pacific, is said to have decided upon building a line through the southeastern part of Colorado and the southwestern part of Kansas, which will enable it to reach the coal fields at and around Trinidad, Col.

Duluth, Milbank & Southwestern.—This company is formed to build a road from Morris, Minn., via Big Stone City and Milbank and Sioux Falls. The survey is now being made.

Florida Central & Western.—The sale of this road, which was to have taken place on Nov. 7, has been postponed to Feb. 6, 1888.

Fitchburg.—After Nov. 12 the road will be operated as a double-track line from Boston to Johnsonville, N. Y., 175 miles. At Johnsonville the road diverges, one branch running south to Troy, the other west to Saratoga and Rotterdam Junction.

Florida Midland.—Track is now laid and the road is in operation from Longwood to Waco, Fla., 27 miles.

Fox River Valley Construction Co.—Organized at Oshkosh, Wis., to build a road from there to Berlin, 23 miles.

Gulf, Colorado & Santa Fe.—The branch from Cleburne to Weatherford, Tex., was opened for business last week.

Housatonic.—At a special meeting of directors in New Haven, Conn., this week, the control of the company passed into the hands of the representatives of the New York & New England.

Indiana & Illinois Southern.—The road is being changed to standard gauge from Effingham, Ill., to Robinson, 51 miles. The other part of the road from Robinson to Switz City was changed some weeks ago.

Kansas City, Rich Hill & Southern.—The profile and estimates of this Missouri road are now completed, and in a few days the directors will meet to take action in the matter of building.

Kansas Midland.—Track has been laid from Wichita, Kan., north 10 miles, and is in progress to Ellsworth, Kan., on the Union Pacific, a distance of 109 miles.

Knoxville Southern.—Work was begun on this road on Nov. 8. It will connect Atlanta, Ga., with Knoxville, Tenn., and with the Louisville & Nashville and the Powell's Valley road will form a through line from the northwest to the southeast. The work is intended to be finished inside of 18 months.

Lake Erie, Essex & Detroit River.—The road is being surveyed from Walkerville to Leamington, Ont., 39 miles, and construction work will soon begin.

Lehigh Valley.—It is proposed to build a branch from West End, Hunterdon County, Pa., to Lake Hopatcong, taking in the towns of Asbury, New Hampton, Changewater, Anderson, Penwell, Stephensburg, Beattytown, and Hack-ettstown.

Long Beach.—The company has been incorporated in California to build a standard gauge road from the Long Beach junction of the Los Angeles & Long Beach through the town of Long Beach, in an eastward direction, to the boundary line between the Ranchos Los Cerritos and Los Alamitos, about 4 miles. Capital stock, \$100,000. Office at Los Angeles.

Macon & Alabama.—The survey of this road from Macon, Ga., to Opelika, Ala., was begun on Nov. 7.

Metropolitan Transit Co.—Justice Donahue, in the Supreme Court, last week, granted the application of this company for a commission to condemn the right of way in Broadway, New York City, where it is proposed to build an elevated road, and appointed as the commission George W. Quintard, Robert L. Cutting and Thomas B. Musgrave.

Milwaukee & Northern.—On Nov. 15 the company will begin running passenger trains between Milwaukee, Wis., and Champion, Mich.

Minneapolis & Pacific.—The road has been extended to a crossing with the Chicago, Milwaukee & St. Paul at Monango, Dak., 288 miles from Minneapolis. Work has been stopped until spring.

The road is now finished and cars are running 30 miles west of Oakes, Minn.

Minneapolis, Sault Ste. Marie & Atlantic.—It is reported that the company intends purchasing the Taylor's Falls & Lake Superior road, 20½ miles in length, from the St. Paul & Duluth Company, and will build a bridge across the St. Croix River at Taylor's Falls, Minn., to connect the road with its own line.

When a small gap between Gladstone, Mich., and Trout Lake is filled the road will be completed through to Sault Ste. Marie. On Dec. 1 the Canadian Pacific will reach the Sault, and the International Bridge will be finished during the month of November.

Minnesota & Northwestern.—The company will let the contract for building its line from St. Paul to Nemadji Bay, Lake Superior, on Nov. 15. It is estimated that the

grading will cost about \$2,000,000, or about \$11,000 a mile.

A circular has been issued calling a special meeting of the directors for Dec. 5 for the purpose of considering the question of the sale of the Minnesota & Northwestern to the Chicago, St. Paul & Kansas City, and to decide on the terms of said sale. Although they are separate corporations, the roads are operated by the same people, and it is probable that a consolidation will be made and the name of the entire road be made the Chicago, St. Paul & Kansas City.

Mississippi Valley.—President Steele states that Henry Laws, an English engineer, is coming to this country in the interest of British capitalists to investigate the merits of the enterprise, with the view of securing its franchises, rights, etc., for the purpose of constructing the line. As projected the road runs from Bowie, Ark., on the west bank of the Mississippi, to New Orleans.

Missouri Pacific.—The Grouse Creek extension is completed to Arkansas City, Kan.

Montgomery & Florida.—The bondholders this week appointed Frank C. Hollins, D. M. Henderson, Granville P. Hawes, H. P. DeGraff and N. T. Sprague a committee to investigate the condition of the property.

New Roads.—A movement is on foot to induce an Eastern syndicate to build a railroad from Eureka, Humboldt County, Cal., to intersect the California & Oregon at Cottonwood.

A light railroad will be built from Santa Ana to Newport, Cal., 10 miles. E. Buck, of Monrovia, Cal., and Col. A. L. Clarke, of Chicago, are interested.

New York, Pennsylvania & Ohio.—A track belonging to this company in Akron, O., was torn up on the night of Nov. 6. The track was put down several years ago against the wishes of the citizens, who made strenuous objections at the time, but the railroad company overcame them and succeeded in getting permission to occupy the street on condition that no cars should ever stand there more than 36 hours. These terms were violated several times, and last week the City Council ordered the track removed. Instead of giving the railroad company their own time, some mysterious party took the matter in hand this week and tore the track up and put down paving where the rails had been.

Northern Pacific.—At the special meeting of the preferred stockholders last week the directors were authorized to issue new bonds to an amount not exceeding \$12,000,000, at a rate of interest not above 6 per cent. The consent of at least three-fourths of the preferred stock is required for the issue of bonds beyond the \$25,000 a mile authorized by the plan of reorganization. The vote was 304,016 out of 377,862 shares. The directors met after the preferred stockholders adjourned and appointed a committee to complete arrangements for the negotiation of a part of the new issue. It is understood that the exact character of the bonds has not been decided upon.

The Commissioner of the General Land Office has cancelled land selections of this company aggregating 6,000 acres located in Washington Territory, within the limits of the forfeited portion of the Oregon Central branch, for the reason that lands within such limits were not granted to the Northern Pacific.

Treasurer Raymond, of Dakota, is holding 8 engines of this company at Fargo to pay the \$40,000 taxes due the territory under the gross earnings law. Unless the company repays or enjoins, the sale will take place Dec. 6.

Ogdensburg & Lake Champlain.—The company has given a contract to the Vermont Construction Co. for an iron bridge over the Chazy River at Champlain, N. Y.

Ontonagon & Brule River.—This road will be extended from Ontonagon, Mich., southward to connect with the main line of the Duluth, South Shore & Atlantic, now being constructed.

Oregon Railway & Navigation Co.—The company has filed articles of incorporation for the building of two more railroads from Lewiston to Camas Prairie, Idaho.

Pennsylvania.—The Board of Public Works of Jersey City, N. J., have granted the petition of this company to elevate its tracks on Railroad avenue in that city. The total cost for the improvement will be something over \$1,000,000. It will take about a year to do the work, it is said.

Rutland.—Charles H. Cole has addressed a circular to the stockholders giving them all an opportunity to sell their stock by forwarding their certificates to him at the Globe National Bank, Boston, before Nov. 19. This is preparatory to a sale by the present managers. Mr. Cole is supposed to be the agent for owners of a majority of the stock, who expect to sell out for 45.

St. Louis, Arkansas & Texas.—Twenty-three miles of track are laid west of Greenville, Tex. A passenger train will be put on this week between Commerce and Greenville.

St. Louis, Fort Scott & Wichita.—The case of this company against Francis Tiernan, the present Mayor of Fort Scott, Kan., was decided in the Supreme Court of that state last week. The decision was against the railroad company. It is a suit by Mr. Tiernan against the railroad company for salary claimed to be due to him as its general manager for the years 1880 to 1884; he also being part of the time president and part of the time vice-president of the company. The salary was at the rate of \$5,000 a year, and the first two years was evidenced by a note of \$10,000, at 10 per cent. from its date, March 10, 1882. The other two years, upon which plaintiff admitted credits to the amount of \$4,600.95, leaving a balance due him upon account of \$5,399.05, with 7 per cent. interest from March 7, 1884. The railroad company denied the execution of the note under oath; denied the payments on account; claimed these payments were made without authority by the officers of the company, and asked judgment for the amount, and then set up a counter claim for the most sum of \$3,804,600.95, which it was claimed the plaintiff had wrongfully obtained of the funds of the company in breach of his fiduciary relations as one of its directors, in the sale of a railroad bed or grade once owned by the Fort Scott, Humboldt & Western, now defunct, to the St. Louis, Fort Scott & Wichita.

St. Paul, Minneapolis & Manitoba.—The company is surveying a new route from Hinkley, Minn., its present junction with the St. Paul & Duluth, to West Superior.

Graders are at work on the extension from Huron to Waconia, Dak.

San Francisco & San Joaquin Valley.—A copy of the articles of incorporation that were filed in San Francisco some time ago have been filed in Alameda County, Cal.

Savannah & Fort Valley.—Incorporated in Georgia to build a road from Savannah or Eden to Fort Valley, 30 miles. E. P. Alexander is one of the incorporators.

Suffolk & Tauboro.—The road is nearly completed from Tunis, N. C., on the Chowan River, to the Roanoke River,

Southern Pacific.—The company has 7 miles of grading completed on its new line from Winters into Lake County, Cal.

Texas & Pacific.—The road was sold at Marshall, Tex., on Nov. 9 to G. J. Wistor, who represents the Purchasing Committee. The price paid was \$6,000,000 for the Eastern Division and \$4,000,000 for the Rio Grande Division. The Atchison, Topeka & Santa Fe put in a bid of \$6,500,000 for both divisions. It is understood that the road will be run as heretofore, with Gov. John C. Brown as President.

Topeka, Silver Lake & Rossville.—A company has been organized to build a road from Topeka to Silver Lake and Rossville, Kan., about 30 miles in length. Capital stock, \$250,000.

Versailles & Midway.—This company will build, if it obtains \$200,000 in county subscriptions, the extension of the Louisville Southern from Lawrenceburg to Lexington, Ky., which the latter company has surveyed.

Wabash Railway.—The Eel River road, running from Logansport to Butler, Ind., 94 miles, has been leased again to this company. The old lease was put to an end when the Wabash went into a receiver's hands. The new agreement just signed dates from April 1, 1887, is for 99 years, and provides for a rental of 2 per cent. for the first five years, 2½ per cent. for the next three years and 3 per cent. thereafter. The first dividend under this lease will be paid this month.

Wabash Western.—President Ashley states that negotiations are progressing satisfactorily towards a consolidation of this company with the lines of the Wabash Railway, which will practically be the reformation of the old Wabash, St. Louis & Pacific.

West Jersey.—The directors have voted to consolidate this company, the Salem Branch, the Swedesboro, the Woodstown & Swedesboro, the West Jersey Terminal and the Maurice River companies.

TRAFFIC AND EARNINGS.

East-bound Shipments.

The shipments of flour, grain and provisions eastward from Chicago to seaboard points amounted last week to 34,459 tons, against 31,250 tons for the week previous, an increase of 3,209 tons. The percentages carried by the different roads were as follows: Chicago & Grand Trunk, 12.9; Michigan Central, 24.9; Lake Shore & Michigan Southern, 11.1; Pittsburgh, Fort Wayne & Chicago, 17.6; Chicago, St. Louis & Pittsburgh, 12.4; Baltimore & Ohio, 5.9; New York, Chicago & St. Louis, 14.2; Cincinnati, Indianapolis, St. Louis & Chicago, 1.0.

Theatrical Rates in the South.

The Southern Passenger Association announces special rates for theatrical parties as follows: 10 to 14 persons, 2½ cents a mile; 15 to 25, 2½ cents; more than 25, 2 cents.

Cotton.

The cotton movement for the week ending Nov. 4 is reported as below, in bales:

Interior markets:	1887.	1886.	Inc. or Dec.	P. c.
Receipts.....	208,875	203,736	I. 5,139	2.5
Shipments.....	175,067	153,049	I. 22,018	14.7
Stock.....	301,961	279,684	I. 22,277	7.9
Seaports:				
Receipts.....	289,174	271,665	I. 17,509	6.4
Exports.....	213,226	185,243	I. 27,983	15.1
Stock.....	684,477	670,687	I. 13,790	2.0

Coal.

The coal tonnages for the week ending Nov. 5 are reported as follows:

	1887.	1886.	Inc. or Dec.	P. c.
Anthracite.....	716,447	722,824	D. 6,377	0.8
Bituminous.....	340,328	308,084	I. 32,244	10.4

Cumberland coal shipments for the week ending Nov. 5 amounted to 64,855 tons, and for the year to that date 2,741,196 tons.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Month of September:				
Atch., T. & S. F.	1,506,261	1,466,246	I.	40,015 2.7
Net.....	671,232	796,261	D.	125,029 15.7
Carolina Central.	54,483	43,484	I.	10,999 25.2
Net.....	30,510	14,358	I.	16,152 113.3
Ches., O. & S. W.	187,043	160,943	I.	26,100 15.0
Net.....	90,151	49,823	I.	40,328 80.9
Chi. Bur. & Q.	2,404,924	2,724,588	D.	259,664 9.5
Net.....	1,133,317	1,593,344	D.	460,027 40.6
Den. & R. G. W.	133,422	90,556	I.	42,866 47.3
Net.....	48,513	31,728	I.	16,785 52.9
Ten months—Jan. 1 to Oct. 31:				
Buff., N. Y. & P.	\$2,316,394	\$2,163,480	I.	\$152,914 7.0
Buff., R. & P.	1,647,052	1,167,675	I.	479,377 41.0
Cairo, V. & C.	623,886	532,454	I.	91,432 14.5
Canadian Pac.	9,092,091	8,121,690	I.	970,401 11.0
Col. H. V. & T.	2,231,314	1,967,167	I.	264,147 13.4
Chi. & Atlantic	1,951,369	1,464,974	I.	486,395 33.2
Chi. & St. P.	20,264,422	19,988,850	I.	275,572 1.4
Chi. & Ind. Coal	318,946			
Chi. & East. Ill.	1,671,210	1,448,897	I.	222,313 13.3
C. I. St. L. & C.	2,212,038	2,146,155	I.	65,883 3.0
Gen. of Georgia.	5,098,419	4,643,631	I.	454,788 9.5
Chi. & W. Mich.	1,153,395	1,125,139	I.	28,256 2.5
Den. & R. Gran.	6,500,437	5,453,564	I.	1,046,873 16.1
Det., Lan. & No.	941,184	908,089	D.	33,095 3.5
Ev. & Terre H.	708,642	643,995	I.	64,647 9.5
Ev. & Ind. Apolis.	195,758	161,259	I.	34,499 21.3
Fr. W. & Den. C.	54,841	339,339	I.	284,498 517.3
Flint & Pere Ma.	2,142,197	1,782,344	I.	359,853 20.1
Ind. B. & W.	2,190,672	2,105,468	I.	85,204 4.0
*K. C., Cl. & Spr.	300,660	181,992	I.	118,668 65.3
*K. C., Fr. & G.	2,130,215	1,934,129	I.	196,086 9.6
*K. C. Sp. & Mem.	1,602,054	1,160,445	I.	441,609 38.0
L. & E. W.	1,700,036	1,433,721	I.	266,315 18.5
Lou., N. A. & Chi.	1,867,228	1,525,579	I.	341,649 22.3
Lou., N. O. & T.	1,714,409	1,347,774	I.	366,635 27.2
Lou. Island.				
Mil. & North.	790,006	522,452	I.	267,554 33.7
Milw., L. S. & W.	2,985,373	2,104,470	I.	880,903 41.8
Mexican Cen.	3,860,557	3,026,738	I.	833,819 27.5
Mobile & Ohio.	1,071,739	1,082,454	D.	10,715 1.0
Norfolk & West.	3,532,782	2,737,378	I.	795,404 29.0
Northern Pacific.	10,815,935	10,129,960	I.	685,975 6.7
N. Y., Ont. & W.	1,295,334	1,128,427	I.	166,907 14.7
Ohio Southern.	472,618	415,935	I.	56,683 13.6
Peoria, Dec. & E.	716,967	672,478	I.	44,489 6.7
St. L. & San F.	4,972,982	3,929,492	I.	1,043,490 26.5
St. P. & Duluth.	1,375,508	1,295,085	I.	80,423 6.2
Tol. & Ohio Cen.	855,678	650,467	I.	205,211 24.1
Tol. A. A. & N. M.	427,702	292,544	I.	135,158 31.2
Wabash (West).	5,863,837	4,905,308	I.	958,529 19.5
Wheeling & L. E.	600,494	481,633	I.	118,861 24.6
Wisconsin Cen.	1,739,840	1,256,565	I.	483,275 38.4
Chi. W. & M.	546,764			
W. St. C. & W.	413,738	231,808	I.	181,930 78.4
Wis. & Minn.	246,691	154,814	I.	91,877 59.3
Total.....	\$113,603,354	\$90,406,044	I.	\$23,197,310 21.2
Net.....			D.	\$50,905 14.2

* Three weeks only in October.

Month of October.

	1887.	1886.	Inc. or Dec.	P. c.
Buff., N. Y. & P.	\$27,000	\$22,200	I.	\$4,800 21.6
Buff., R. & P.	174,238	141,850	I.	32,388 22.8
Gen. of Georgia.	659,927	569,042	I.	90,885 16.0
Cairo, V. & C.	72,176	62,024	I.	10,152 16.3
Canadian Pac.	1,240,000	1,078,000	I.	162,000 15.0
Col. H. V. & T.	283,570	274,794	I.	8,776 3.2
Chi. & Atlantic	212,476	172,707	I.	39,769 23.0
Chi. & St. P.	2,800,400	2,795,677	I.	4,723 0.2
Chi. & Ind. Coal	47,319	2,801	I.	24,518 108.5
Chi. & East. Ill.	198,387	176,615	I.	21,772 12.3
C. I. St. L. & C.	234,179	247,952	D.	13,773 5.5
Chi. & W. Mich.	128,619	124,542	I.	4,077 3.2
Den. & R. G.	790,000	702,868	I.	87,132 12.3
Det., Lan. & No.	90,448	132,734	D.	33,286 25.2
Ev. & Terre H.	75,269	68,728	I.	6,541 9.5
Ev. & Ind. Apolis.	19,223	19,851	D.	628 3.1
Fr. W. & Den. C.	65,164	55,000	I.	10,164 18.4
Ind., Bloom. & W.	253,142	245,346	I.	7,796 3.1
Lake Erie & W.	103,052	103,678	I.	626 0.6
Louis., N. A. & C.	202,269	187,636	I.	14,633 7.8
L. N. O. & Tex.	255,127	187,319	I.	67,808 35.3
Long Island.	265,966	237,508	I.	28,458 11.9
Louis. & Nash.	1,500,280	1,382,553	I.	117,727 8.5
Mil. & Northern.	91,130	62,813	I.	28,317 45.5
Mil. L. S. & W.	298,512	251,552	I.	46,960 18.6
Mexican Cen.	425,700	345,785	I.	79,915 23.0
Mobile & Ohio.	257,173	231,410	I.	25,763 9.7
Norfolk & West.	397,752	317,021	I.	80,731 25.4
Northern Pacific.	1,598,842	1,443,667	I.	155,175 10.7
N. Y., Ont. & W.	140,373	117,150	I.	23,223 19.8
Ohio Southern.	61,129	54,992	I.	6,137 11.1
Peoria, Dec. & E.	80,908	80,691	I.	217 0.3
Pitts. & West.	176,462	143,857	I.	32,605 22.6
St. P. & Duluth.	204,926	212,364	D.	7,438 3.5
St. Louis & S. F.	637,300	533,500	I.	103,800 17.5
St. L. A. & T.	363,285	186,339	I.	176,946 94.9
Tol. & Ohio Cen.	107,051	83,525	I.	23,526 28.1
Tol. A. A. & N. M.	35,962	36,202	I.	240 0.7
Wabash (West).	628,009	562,598	I.	65,411 11.6
Wheeling & L. E.	66,014	52,267	I.	13,747 20.2
Wisconsin Cen.	1,739,840	1,256,565	I.	483,275 38.4
C. W. & Min.	79,138	34,223	I.	44,915 131.3
M. St. C. & W.	413,738	281,808	I.	131,930 32.4
Wis. & Minn.	246,691	154,814	I.	91,877 59.3
Total.....	\$19,352,270	\$16,864,247	I.	\$2,488,023 14.7
Net.....			D.	\$55,170 14.7

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Circus Rates.

The chairmen of the Western States Passenger Association, the Southwestern Statistical Bureau and the Western and Northwestern Freight Bureaus, acting as a committee on circus rates, have made the following recommendations:

Box, stock, flat, elephant and commissary cars, for distances of 50 miles and less, \$12 per car; same, over 50 miles, but not exceeding 75 miles, \$15; same, over 75 miles, but not exceeding 100 miles, \$17; same, over 100 miles, but not exceeding 150 miles, \$21; same, over 150 miles, but not exceeding 200 miles, \$25; same, over 200 miles, but not exceeding 300 miles, \$30; same, over 300 miles, 10 cents per car per mile.

Subject to the following:

1. The above rate will apply to cars not exceeding 40 ft. in length, external measurement. Cars exceeding 40 ft. in length, external measurement, to be charged 3½ per cent. additional for each foot or fraction thereof in excess.

2. In the case of rates marked "x," if but a single run is to be made, 20 per cent. additional to be charged, but not in excess of the charge for run of over 150 miles, but not exceeding 200 miles.

3. At the above rates 15 cars will be the minimum number to be charged for.

4. If there are 20 cars or more, but less than 30, deduct from the above rates 10 per cent.

5. If 30 cars or more, but less than 40, deduct 15 per cent.

6. If 40 cars or more, deduct 20 per cent.

7. Advertising cars on regular freight train or in regular passenger train, when carrier elects to transport in passenger trains, 25 cents per car per mile actual mileage, minimum charge for each run or stop, \$10 per car; fifteen men, bona fide employees of the show, actually engaged in traveling work, to be the maximum number of persons to be carried with any car at the above rate.

8. Passenger or sleeping-cars, forwarded in the circus train, \$1 per car mile, actual mileage, for runs of 50 miles or less; 75 cents per mile, actual mileage for runs of over 50 miles but not exceeding 100 miles; 50 cents per mile, actual mileage for runs of over 100 miles; same to include the transportation of bona fide employees of the circus, all other persons to pay full fare.

9. Cars to be furnished by owners of show. At the above rates all cars, including advertising cars, passenger or sleeping cars, are to be furnished by the proprietor of the show, free of any cost for rent or mileage, and such cars shall be subject to acceptance by the operating department of the road, all of the property to be loaded and unloaded by the owner, and said rates are made subject to a written contract to be executed, relieving the carrier from all loss or damage.

10. If cars are furnished by the carrier, Class A rates will govern for each separate run, i. e., between each stand upon the paraphernalia of the show, and full fare will be charged for the transportation of employees.

Exports via Boston.

The Central Traffic Association announces the following rules relating to business for coastwise points east of Boston: 1. Freight consigned direct to ports east of Portland, Me., to be billed to Boston at the New York rate. 2. Freight consigned to Boston or Portland without specific directions for export must be billed at the through domestic inland rate. 3. Rebates made at Boston on freight billed at inland rates and afterwards exported must be reported to the western roads with full proof that the goods have actually been exported, together with a statement of all precautions taken against fraud. 4. The eastern railroads are recommended to make no rebates on re-exported traffic which may have the effect to reduce the through rate below the regular through rate in effect from western shipping points to the final destination.

Local Freight Rates in Illinois.

The Chicago, Burlington & Quincy has prepared a new local freight tariff which reduces rates on all classes except grain from 20 to 35 per cent. It is said that this road and the Wabash are to make reductions on this scale in all their local rates within the state of Illinois, though we have seen no official announcement of the date when such reduction will go into effect. The Chicago papers intimate that the action of the state Railroad Commissioners on questions concerning freight rates are influenced by political motives, one of the Commissioners having announced himself as a candidate for Governor.

California Coastwise Freight Rates.

A new line of steamers has been established between San Francisco and coastwise ports which competes sharply with the Pacific Mail Steamship Co. Freight rates are reported at present as 40 per cent. less than they were by the Pacific Mail before the competing line was started.

ANNUAL REPORTS.

Old Colony.

The twenty-fourth annual report of this company for the year ending Sept. 30, 1887, has been issued. The mileage last year was 469.38 miles; no report of mileage is made this year. The equipment includes 140 locomotives, 276 cars in the passenger service, and 3,145 of all other kinds—1,239 are coal cars; 47 box cars are fitted with air brakes, 13 of which have also Miller platforms. During the year 7 locomotives, 13 passenger cars, 2 baggage cars and 155 freight cars have been either built or purchased. The cars and engines of the Hanover Branch Company have also been added to the equipment. The growth of the passenger business makes it necessary to further increase the passenger equipment, and contracts have been authorized by the directors for the purchase of 20 passenger cars, to be delivered ready for use in the spring of 1888.

The general balance sheet is as follows:

Cost of road and equipment.....	\$20,692,280
Stocks and bonds held.....	1,192,377
Real estate.....	497,185
Cash and cash items.....	531,606
Bills receivable.....	134,185
Materials.....	422,131
	\$23,459,773
Capital stock.....	\$11,384,600
Stock of B., C. F. & N. B. and Lowell & Framingham railroads unconverted.....	11,025
Bonds.....	9,607,300
Bills and accounts.....	1,335,854
Improvement account.....	226,394
Miscellaneous.....	241,184
Surplus.....	792,516
	\$23,459,773

The earnings for the year were as follows:

	1887	1886	Inc. or Dec.	P. c.
Passenger	\$2,572,576	\$2,382,049	I.	\$190,527 7.9
Freight	1,905,924	1,857,264	I.	48,660 2.6
Express	140,905	134,444	I.	6,461 4.8
Rents	63,990	60,042	I.	3,948 6.5
Mails	43,189	43,895	D.	706 1.6
Extra baggage	16,128	14,200	I.	1,928 13.7
Miscellaneous	3,859	36,138	D.	3,279 9.0
	\$4,865,571	\$4,528,032	I.	\$337,539 7.4
Oper. expenses	3,277,591	2,990,707	I.	286,884 9.5
Net	1,587,980	1,537,325	I.	50,655 3.3
Taxes	255,404	234,398	I.	21,007 9.2